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Railway Mail Pay Developments

The Bourne committee's report on mail pay was not presented in Congress on June 4, the press report to that effect having been given out prematurely. It appears that the committee at the last moment decided to further study the question of rates, and seems to be still studying it. In the meantime some interest apparently unfriendly to the committee secured the introduction of the Moon bill. It is charged that the postmaster general is responsible for this discourtesy to the committee, and in view of the general attitude of the post office department toward the railroads during the past year or two, this is not incredible. The Moon bill (noticed last week, page 1343) contains a half page of matters not related to transportation, and seems well calculated to become a political football; whereas the Bourne committee's plan embraces a simple scheme for putting mail pay on a rational basis. What its recommendation finally will be, in the matter of rates per car per mile, remains to be seen; but Mr. Peters, chairman of the railroads' committee on mail pay, says that the other bill (Moon's) will reduce the gross amount paid to the railroads ten millions a year. As the post office department has for years been trying by every available indirect means to effect a reduction in the railroads' compensation, this statement is not surprising. There is great need of a thorough airing of the whole subject on the floor of the House. The Bourne committee has made a thorough study of its subject and gives lucid reasons for all of its conclusions—a thing which it has not heretofore been possible to say concerning the deliverance of any branch of the government on this subject; and its report should be given to the public without delay.

Conductors' Vacations With Pay

Philadelphia newspapers report that the passenger conductors of the Pennsylvania Railroad—there are about a thousand of them, east of Pittsburgh—are not to get their two weeks' vacation with pay, this summer, as in former years. The big addition to the pay rolls forced on the company by the conductors' brotherhood has made it necessary to retrench at every possible point. However, this loss of vacation is not the result simply of a cold blooded notice from the company, like a thunder-clap out of a clear sky; it is a logical result of the recent arbitration. By Article P, of the decision, a conductor desiring to retain former privileges has to accept former rates of pay; or, if he takes the new rates, he must accept the new conditions. Taking the sweet from both old and new, and rejecting the bitter in both, as was possible under some former arbitrations, is forbidden. Conductors who accept old rates of pay will still have the vacation—a gift from the company of from $60 to $80. Presumably, most or all of them will make more money in a year by accepting the new wages, and losing two weeks' time, but it is regrettable to substitute a cold financial arrangement for one which had a little humanity in it. The plan of an automatic vacation of two weeks has desirable elements not to be despised. By the new arrangement a man desiring to lie off two weeks must specifically resolve to sacrifice a sum of money, say $80. One man may worry over the loss of this money. Another may deny himself a vacation when he needs one. It is true that the piece work system—being paid by the trip—now universal, is not congruous with the plan of vacations with pay, but the officers of the Pennsylvania, with a humanitarianism all too rare among railroad officers—who are constantly tempted to stifle their judgment and their courage, and to look only for the approval of the finance committee, which declares the dividends—must now reflect that their generosity is wasted. They have doubtless given this gratuity for years in the hope of educating the conductors up to a point where they would see that the dollar is not the only measure of the value of the men to the company and the company to the men; but with poor result.

Shopmen Watching Capital Expenditures

In contrast with the foregoing illustration of the relations between railroad men and their employer, and how such relations sometimes are thoughtlessly changed so as unexpectedly to affect the interest of one or the other, is the report from Springfield, Mo., that the workmen in the shops of the St. Louis & San Francisco in Springfield are actively opposing the demand of the Springfield Jobbers' and Manufacturers' Association that the railroad company build a new passenger station in that city. The railroad employees fear that such a big drain on the road's treasury might compel the laying off of some of their number. The jobbers petitioned the state public service commission for an order for a station, and the railroad men followed with a remonstrance. It is a hopeful sign to see railroad employees thus interested in the public side of railroad business. We do not pretend to decide whether Springfield does or not need a new station; it may possibly be that the shopmen are not properly mindful of the general public interest. It is certain, from their own statement, that their primary motive is purely a selfish one. But it is a good thing to have discussions, such as an occasion like this will bring out, which will show in a forcible way that the interests of railroad owners and railroad employees are often identical. Possibly the true inwardness of the big-station problem may come in for an airing, to the enlightenment of citizens generally. A beautiful and imposing station costs a lot of money; a big lot compared with no station at all—which is what passengers on the interurban trolley roads (competing with the steam roads) in many cases have to get along with. The imposing station has to be paid for by the public in fares and freight bills. For the essentials of spaciousness, light, convenience and cleanliness, a new station often has little advantage over its predecessor *if* the old one is kept in the best possible condition. The New York, New Haven & Hartford, like the Frisco, has to count its pennies; and recently it told the people of Hartford that the old station, badly damaged by fire, would have to be fixed up. The city of Hartford cannot have its desired new station, just now. But, presumably, Hartford's only loss is the loss of an architectural monument. Architectural monuments, however, constitute an element of "the city beautiful" for which railroads sometimes pay more than their fair share.

Economies in Passenger Service

The correspondent whose letter is published elsewhere in this issue was probably impressed, as were a great many other people, by Mr. Brandeis' statement of the contrast between the economies that had been made in the freight service through the increase in train load and the ever growing expense of passenger service because of changes in public demands. As a remedy the correspondent suggests the development of a heavier and more powerful type of passenger locomotive which would be able to haul from 15 to 20 cars. Without going into the question of whether or not this is feasible from the mechanical point of view, a saving in passenger service through the introduction of 20 car trains is in the great majority of cases out of the question purely from the operating point of view. There are comparatively few passenger trains which are now run in two sections because the locomotive is not powerful enough to haul all of the traffic which can be developed for that train. For far and away the greater number of passenger trains that are run, even the light locomotives that are in use, are not loaded to their full capacity. The public demands frequency of service as well as speed. Of course, there are certain specific cases where more powerful locomotives could be used to advantage, thus the Pennsylvania, the New York Central and the Santa Fe, and probably a good many other roads have some trains which they have to run quite frequently in two sections. Even on these trains, however, passengers object very strongly to having to walk long distances to get to their car, and since most of the trains that are now running two sections cater especially to a high class of passenger traffic and large amounts of money are spent to make them in every way as attractive as possible the passenger department would probably seriously object to making some of the patrons of such trains walk the length of 20 cars to get to their reservations. Passenger trains could now be loaded more fully than they are were it not to the objection of the public to sharing a seat with a stranger or taking an upper berth.

SOME REFLECTIONS ON THE FEDERAL VALUATION OF RAILWAYS

NOW that the federal act providing for a valuation of common carriers has been in force for 15 months, and work is actually under way in each of the five districts into which the country has been divided, as described in another column, it may be timely to review briefly some of the salient features of the valuation problem as they now appear.

One of the questions most frequently raised is as to the time that will be required to complete the work. When the valuation act was under discussion in Congress it was commonly stated that the project could be carried out within five years. At present, with one-fourth of this period gone, less than 1,000 miles of line have been inventoried. The rate of progress made is directly dependent on the appropriations provided by Congress. The Interstate Commerce Commission is proceeding as fast as the available appropriations will permit, and four field parties are employed in each district. With the expectation of an increased appropriation for the coming fiscal year, plans are being made to place six more parties in the field in each district shortly after July 1. But this will make only ten parties in each district, and it is estimated that even with 25 parties in each district it will require six years to complete the field work alone on the 250,000 miles of railways already in existence. As the present overhead organization of the Division of Valuation can handle 25 parties in each district, it would appear that Congress, if acting in good faith, must see the wisdom of providing sufficient funds to permit of the employment of at least this number of parties. Even if this were done it seems improbable that the valuation of all the railways would be actually completed in less than ten years. Unless the work is completed within a reasonable time the information gathered during the early part of the work will be out of date and worthless before the latter part is well begun.

One thing which has created much comment has been the selection of the roads to be inventoried first. As stated in another column, the first roads chosen were the Norfolk Southern, the Atlanta, Birmingham & Atlantic, the New Orleans, Texas & Mexico, the Texas Midland and the San Pedro, Los Angeles & Salt Lake. Parties have since been started on the Boston & Maine, the Chicago & Eastern Illinois, the Kansas City Southern and on branches of the Great Northern and the Minneapolis, St. Paul & Sault Ste. Marie. While it was essential that roads with short mileage be selected at first so that the methods of procedure could be developed and perfected, and while it was advisable where possible to take roads recently constructed and with more complete construction data, it would be hard to select a group of roads on which there would be less likelihood of making valuations that would exceed the capitalizations than the short roads first chosen. On the other hand the valuations of the Bessemer & Lake Erie, the Pittsburgh & Lake Erie, the Cincinnati, New Orleans & Texas Pacific, the Elgin, Joliet & Eastern, etc., will almost certainly exceed their capitalizations. It is hard to understand why at least one of the short roads of this class could not have been chosen.

There has been considerable criticism, especially from those who took the civil service examinations for the more responsible positions, because of the practice of the board of engineers in offering prospective employees salaries considerably below the maximum salaries specified for the different positions. In announcing the examinations the Civil Service Commission, like

the United States army recruiting offices, strongly emphasized only the more attractive features. But the Interstate Commerce Commission and its board of engineers are in no way responsible for this, and they deserve to be commended for working upon a strictly business-like basis, recruiting their forces at salaries no larger than were necessary to secure men with the proper qualifications. There is no more reason why the United States government should pay needlessly high salaries than why any private concern should do so.

In any work of such magnitude and such unprecedented character it is to be expected that many differences of opinion will arise. As a whole, it has been so conducted thus far as to warrant the confidence and justify the co-operation of railway men.

CAN THE RAILWAYS REGULATE THEMSELVES?

WHETHER the railways can regulate themselves has become a question of vital importance. It is not meant to imply that their regulation by themselves should be completely substituted for regulation by the government. That could not be accomplished, even though it were desirable. The question it is intended to raise here is whether it is not practicable, even at this late day, for the railways to adopt some method of regulating themselves which will reduce the amount of railway mismanagement that takes place, thereby rendering unnecessary the frequent exercise of a large part of the powers which the Interstate Commerce Commission and other commissions now exercise, and tending to prevent further restrictive and punitive legislation to eradicate and prevent recognized evils and abuses in the transportation business.

Year by year regulation grows more pervasive and burdensome. If such measures as the bill now in Congress to require every issue of securities to be vised by the Interstate Commerce Commission continue to be passed it will not be long before all discretion in management will be taken from railway directors and officers. With their discretionary authority will disappear a great part of the initiative and enterprise of private management. But there have been and are causes for the railway legislation that has been and is being passed. There is hardly a regulatory law that has been passed or that is proposed that has not been suggested and, in the opinion of most of the public justified, by evils and abuses that have been disclosed in the management of some one or more leading railway systems. The legislation to which such disclosures give rise applies to, all railways alike, and, so far as it is harmful, hurts all alike. Therefore, all railways have a very direct and vital concern in preventing and eliminating the evils and abuses that lead to the scandals that cause harmful regulation.

Since every railway is thus directly concerned regarding the mismanagement of any other railway that may get all railways into trouble, it is the moral right of the railways as a body to police the individual railways for the purpose of seeing that they maintain high and defensible standards of management. It may be said that this is impracticable. It may not be practicable, but it is not impossible, and as F. A. Delano indicates in a recent letter to the Chicago *Tribune*, it ought to be done. The railway managers maintain organizations to oppose the legislation which the high financiers, grafters and boneheads who are always breaking into their business are bringing about. Why, then, could they not and should they not maintain organizations to prevent these people from doing the things that bring about the legislation? Or, better still, why should not the same organizations through which operation and regulation are now dealt with be broadened to prevent the causes of regulation? Why should not the American Railway Association so investigate and police the physical operation of railways as to expose bad practices and compel their abolition? A committee of the association proposed such a plan last November for dealing with the accident question, but the association, with characteristic indecision and timidity in dealing with matters of importance, rejected the plan and adopted nothing in its place. Why should there not be an organization of directors, chairmen and presidents to prevent such financial outrages as have been committed on the Chicago & Alton, the New Haven and the Frisco? Why should the capably and honestly managed railways let juggling of stocks, grafting, faulty operation go on on some roads without an effort to stop them when everybody knows that as certainly as day follows night these things will lead to scandals and that the scandals will create a public sentiment and cause regulation that will hurt every railway in the country?

The sum of the whole matter is that there is going to be regulation of all phases of railway management. If the railways as a whole will themselves only do their part of it the regulating can make things so hot for individual managements that act foolishly or crookedly as to forestall much public regulation which otherwise will inevitably come, and at the same time greatly improve public sentiment toward the roads. If undesirable powers continue to be conferred on the commission, the roads can reduce the harmful effects of the existence of such powers to a minimum by so policing themselves as to reduce to a minimum the amount of policing public authorities will have to do. It is certain that the less the roads police themselves the more they will be policed by others. Experience has been proving this for so many years that even the dullest must now see it. If effective policing of the railways by themselves is to be done it must have the vigorous co-operation and support of those who control the financial policies of railways as well as of their executive officers.

Will the railway directors and executive officers ever recognize the need for taking comprehensive measures to prevent the pretexts and causes of unwise and harmful regulation? Or will they go on in the future, as they usually have in the past, letting the pretexts and causes of regulation go on accumulating under their very eyes, and confine their exertions regarding regulation to puny and ineffectual efforts to prevent it after the misconduct of a few of them and the timidity and inactivity of a great majority of them have made it inevitable?

THE SHREVEPORT DECISION

ONE of the greatest obstacles to effective prevention of discrimination, which was the primary object of regulation, has arisen from our dual form of government and the relation between state and federal authority. State legislatures and state commissions have repeatedly prescribed rates or regulations which have not only been a burden on interstate commerce, but have actually discriminated against such commerce until the railways have, as in many instances, applied the state rates to their interstate business.

The two vitally important things which the Shreveport decision has done to overcome this obstacle are that the court has held that if state compelled intrastate rates discriminate against interstate commerce, a reduction in interstate rates is not the only remedy, secondly, the court has pointed out the way in which such a discrimination may be remedied without the reduction of the interstate rates, namely, through an appeal to the Interstate Commerce Commission. This second pronouncement is almost, if not quite, as important as the first. The court in substance implies that whereas through a long series of decisions the power of the Interstate Commerce Commission to pass upon what is reasonable has been upheld at the expense of the railroad, the court will equally uphold the federal commission if the railroads are able to convince that body that they are in the right and the state commissions are in the wrong.

The decision sustains the contention for which the railways have been fighting for years, and which many expected would to be upheld in the state rate cases decided a year ago. The court holds, not only that Congress in the exercise of its authority to regulate interstate commerce has the power to protect that commerce against discrimination, but that it has conferred that power on the Interstate Commerce Commission.

The original case before the Interstate Commerce Commission arose from the complaint of the Railroad Commission

of Louisiana that the railways involved maintained unreasonable rates from Shreveport, La., to points in Texas and that they discriminated in favor of traffic within the state of Texas against traffic from Louisiana into Texas by maintaining rates out of Dallas and other points into eastern Texas, much lower than those into Texas from Shreveport. Six opinions were published by the commission, the majority opinion by Commissioner Lane, concurring opinions by Commissioners Prouty and Clark, and dissenting opinions by Commissioners Clements, Harlan and McChord. The commission found the class rates out of Shreveport to certain Texas points unreasonable and established maximum class rates for this traffic which were later put in force by the carriers. It also held that as to the commodity rates, a discrimination was created against Shreveport, and the carriers were ordered to desist from charging higher rates for the transportation of any commodity from Shreveport to Dallas and Houston and intermediate points than were contemporaneously charged for the carriage of such commodity from Dallas and Houston toward Shreveport for equal distances. This left the roads free to avoid the discrimination either by reducing the interstate rates from Shreveport or by raising the level of the competing intrastate rates. Under previous interpretations of the law the latter alternative seemed impossible, to say nothing of the probability that it would be followed by reprisals by the Texas commission, which had admittedly sought to adjust rates in the interest of Texas jobbers.

The carriers appealed to the Commerce Court on the ground that, as the discrimination arose out of the relation of intrastate rates, maintained under state authority, to intrastate rates that had been upheld as reasonable, its correction was beyond the commission's power, and that so far as the interstate rates were sustained as reasonable the commission was without authority to equalize them with the lower intrastate rates. The decision of the Commerce Court was that the order relieved the appellants from further obligation to observe the intrastate rates and that they were at liberty to comply with the commission's requirements by increasing those rates sufficiently to remove the forbidden discrimination. This holding is now affirmed by the Supreme Court.

The roads, in order to make a complete test, challenged the validity of the order on two grounds: That Congress is impotent to control the intrastate charges of an interstate carrier even to prevent injurious discrimination against interstate traffic, and that even if Congress has this power it has not exercised it, and hence the commission exceeded the limits of its authority.

These objections the Supreme Court completely swept aside. As to the power of Congress it says in part:

> The fact that carriers are instruments of intrastate commerce, as well as of interstate commerce, does not derogate from the complete and paramount authority of Congress over the latter or preclude the federal power from being exerted to prevent the intrastate operations of such carriers from being made a means of injury to that which has been confided to federal care. . . . This is not to say that Congress possesses the authority to regulate the internal commerce of a state, as such, but that it does possess the power to foster and protect interstate commerce, and to take all measures necessary or appropriate to that end, although intrastate transactions of interstate carriers may thereby be controlled.
>
> It is immaterial, so far as the protecting power of Congress is concerned, that the discrimination arises from intrastate rates as compared with interstate rates. The use of the instrument of interstate commerce in a discriminatory manner so as to inflict injury upon that commerce, or some part thereof, furnishes abundant ground for federal intervention. Nor can the attempted exercise of state authority alter the matter, where Congress has acted, for a state may not authorize the carrier to do that which Congress is entitled to forbid and has forbidden.
>
> It is also to be noted—as the government has well said in its argument in support of the commission's order—that the power to deal with the relation between the two kinds of rates, as a relation, lies exclusively with Congress. It is manifest that the state cannot fix the relation of the carrier's interstate and intrastate charges without directly interfering with the former, unless it simply follows the standard set by federal authority.
>
> It is for Congress to supply the needed correction where the relation between intrastate and interstate rates presents the evil to be corrected, and this it may do completely by reason of its control over the interstate carrier in all matters having such a close and substantial relation to interstate commerce that it is necessary or appropriate to exercise the control for the effective government of that commerce.

With regard to the scope of the power granted to the commission the court says that the language of section three is "certainly sweeping enough to embrace all the discriminations of the sort described, which it was within the power of Congress to condemn."

The opposing argument rested upon the proviso in the first section of the act that it shall not apply to transportation wholly within one state. In discussing this point the court explains the difference between this case and the Minnesota rate case, in which the carriers had hoped for a decision similar to the one now given.

The court says, after quoting section one:

> Congress thus defined the scope of its regulation and provided that it was not to extend to purely intrastate traffic. It did not undertake to authorize the commission to prescribe intrastate rates and thus to establish a unified control by the exercise of the rate-making power over both descriptions of traffic. Undoubtedly—in the absence of a finding by the commission of unjust discrimination—intrastate rates were left to be fixed by the carrier and subject to the authority of the states or of the agencies created by the states. This was the question recently decided by this court in the Minnesota Rate Cases. There, the state of Minnesota had established reasonable rates for intrastate transportation throughout the state and it was contended that, by reason of the passage of the act to regulate commerce, the state could no longer exercise the state-wide authority for this purpose which it had formerly enjoyed; and the court was asked to hold that an entire scheme of intrastate rates, otherwise validly established, was null and void because of its effect upon interstate rates. There had been no finding by the Interstate Commerce Commission of any unjust discrimination.
>
> Here, the commission expressly found that unjust discrimination existed under substantially similar conditions of transportation and the inquiry is whether the commission had power to correct it. We are of the opinion that the limitation of the proviso in section one does not apply to a case of this sort. The commission was dealing with the relation of rates injuriously affecting, through an unreasonable discrimination, traffic that was interstate. The question was thus not simply one of transportation that was "wholly within one state."

As to the contention that the prohibition of discrimination does not relate to the result of conditions wholly beyond the control of a carrier, the court says "in view that the commission was entitled to make the order, there is no longer compulsion upon the carriers by virtue of any inconsistent local requirement. So far as these interstate rates conformed to what was found to be reasonable by the commission the carriers are entitled to maintain them, and they are free to comply with the order by so adjusting the other rates, to which the order relates (the Texas rates) as to remove the forbidden discrimination. But this result they are required to accomplish."

No language could be plainer. If a state makes rates which are so low as to pull down the interstate rates the railways may apply for relief to the Interstate Commerce Commission, whose duty will then be to inquire into the reasonableness of both sets of rates. If the interstate rates are found to be reasonable the state rates may be nullified. The railways are not only permitted, but are required to raise them.

The decision should have an important bearing on the present controversy regarding allowances to industrial roads, which the Interstate Commerce Commission has ordered withdrawn, and which have been reinstated as to intrastate business by several state commissions. If the Interstate Commerce Commission persists in its opinion that these allowances are illegal as to interstate traffic the action of the state commission would clearly constitute a discrimination against interstate traffic, and under the Shreveport decision would have to give way.

The outcome, however displeasing it may be to the kind of states' rights advocates represented by the Texas Railroad Commission, should cause great satisfaction to all friends of regulation. Railway regulation is a national, not a local problem, and it must not be thwarted by the selfish or misguided motives of local authorities. As Commissioner Lane said in the original report in the case: "The theory of our constitution is that a state may not live to itself alone, either politically or commercially." The assertion of the right of a state to do so po-

litically brought about the Civil War. Through a policy of its own, made effective by consistent and vigorous action on the part of the Texas Railroad Commission, which Commissioner Lane described as acting "in loco parentis" to the jobbing interests of the state, Texas has endeavored to surround itself with commercial boundaries comparable to those that South Carolina attempted to establish politically. Under the transportation and commercial conditions that have been developed in this country, and under which Congress has repeatedly manifested its purpose to unite our railroads into a national system, interference by local and selfish regulation of the states has become almost as intolerable as the attempt at secession.

It is interesting to note the progressive steps by which, as commerce has expanded without regard to state lines, the power of the states has been gradually curtailed by successive decisions of the courts. In the earliest form of railway regulation numerous state legislatures passed laws requiring wholesale reductions in rates. The courts at first sustained such action, but subsequently held that the determination of the reasonableness of rates was a judicial function and that they could prevent law-making bodies from fixing rates that were confiscatory. Another long step was taken when it was held that states could not regulate interstate rates even when they nominally restricted the regulation to the part of the hauls within the state borders. Also, in cases involving regulation of operation, in some instances of the courts have held invalid state regulations which interfered with federal regulations.

The Shreveport decision naturally increases the duties and responsibilities of a commission that is already greatly overburdened with work. The logical effect of this should be to renew interest in a plan which has already been suggested several times by members of the commission and others, for creating deputy commissioners to be located in the principal commercial centers, and to try local cases somewhat as district judges hold court, with the right of appeal from their decisions to the commission at Washington.

NEW BOOKS

Other People's Money. By Louis D. Brandeis. Published by Frederick A. Stokes Co., New York. 223 pages. Price $1.

The full title of this collection of vividly written essays by Mr. Brandeis is "Other People's Money and How the Bankers Use It." They were originally published in *Harper's Weekly*. The names of the ten chapters are, Financial Oligarchy, How the Combines Combine, Interlocking Directorates, Serve One Master Only! What Publicity Can Do, Where the Banker is Superfluous, Big Men and Little Business, A Curse of Bigness, The Failure of Banker Management, The Inefficiency of the Oligarths. While the book deals with the influence of the bankers on all forms of big business, industrial as well as railroad, it contains a rather remarkably accurate forecast of the New York, New Haven & Hartford situation as it later developed (all the articles were written before November, 1913). Throughout the book, of course, Mr. Brandeis is the lawyer pleading one side of the case. He analyzes in an admirably simple and effective manner the evils of interlocking directorates, banking influences on railroad directorates, etc., but dismisses in airy fashion the fact that railroads which have attempted to get along without the help of investment bankers after a certain stage in their development has been reached, have generally been failures. It is the fashion of the day to complain of the profits of the middle man. The banker is, of course, the middle man in the sale of railroad and other large corporation securities, but the mere fact that the banker is neither pioneer in the development of the industry nor the final consumer of the security, that is, the ultimate investor, does not necessarily indicate that he is any the less a useful member of society. By the same token, although Mr. Brandeis' book gives but one side of the question, it is none the less interesting and instructive.

Letters to the Editor

INCREASING THE PASSENGER TRAINLOAD

NEW YORK, June 8, 1914.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The decreased earnings of passenger traffic is a serious problem and as the building of lighter rolling stock does not seem possible under the present requirements, some other solution must be found. A possible one is that the same methods which increased freight revenue be applied. The limit of passenger power has by no means been reached. The Pennsylvania has developed the 4-4-2 type to a high degree, and if the same constructional features were applied to the 4-6-2 design, it is probable that 18 to 20 steel cars could be hauled on schedules requiring averages of 45 miles per hour.

As regards the air brake, no trouble should be experienced with the P. C. or A. C. equipments. Ten or 15 years ago trains with 16 or 17 cars were not infrequent on some roads, and no trouble was experienced in handling with the high speed brake, which of course is inferior to the modern equipments.

Long trains would result in combining many of the present trains which run regularly with seven or eight cars, and the many economies incident to heavy freight trains would also be realized in passenger service.

As regards station accommodation, lengthening the platforms at the important stations would not involve any great expense, whereas most of the terminals have sufficient platform length for at least 20 cars. WILLIAM G. LANDON.

"BRAKES STICKING"

NEW YORK, June 11, 1914.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Is not our governmental regulating machinery breaking down of its own weight? Washington despatches of this morning say that the Interstate Commerce Commission is going to adjourn until autumn, having finished writing its report on the general freight-rate increase question. Two reasons are given for this long vacation: first, the commissioners want to rest and, second, some of the railroad presidents want to go to Europe, and desire to feel free from worry while they are absent from home. A third reason might be named—the public wants a rest. It would be a great boon if the activities of the Interstate Commerce Commission could be confined to nine months in the year. On general principles, rest is a good thing. That government governs best which governs least. This is a maxim which would apply at the present time with peculiar appropriateness.

But our governing machinery has been set in motion; and stopping it causes serious losses. The commission, while it is resting, leaves all business interests hung up. A proposed increase in freight rates, no matter how important or how thoroughly justified, is suspended indefinitely when any little upstart of a local board-of-trade secretary chooses to put in a protest. Mr. Westinghouse expended millions of dollars to perfect his air brake so that, although automatic, in the sense that it should stop a train when a stop was necessary, it should not be constantly annoying the trainmen and passengers, and causing danger, by undesired applications. But in the freight-rate field we meekly submit to an arrangement which is equivalent to an air brake that is always going on when you don't want it to go on.

It is said that an investigation of the Cincinanti, Hamilton & Dayton and the Pere Marquette has been begun by the Interstate Commerce Commission, but that action in the matter will be entirely suspended until fall. Here is a case involving millions and millions of dollars. If such an investigation is useful and is needed it ought to be made without delay. Were we not bet-

ter off with our former system of having matters of this kind attended to in the Federal District Court? The courts are slow enough, in all conscience, but they at least get down somewhere near the ground; they are in some sense neighbor to the interests which they are dealing with. For a body of men in Washington, however wise, to attempt to handle the details of business throughout our three millions of square miles, is absurd on its face.

Let us assume that the commission will grant the 5 per cent. increase in freight rates; it will not go into effect until about August 1—at least a whole year behind time. Are the benefits of publicity valuable enough to offset the losses due to this ponderous plan under which "brakes sticking" is the condition for at least half the time, of at least half the cars, of all the trains in the country? M. E.

GET TOGETHER

Chicago, June 9, 1914.

To the Editor of the Railway Age Gazette:

The editorial entitled "The Railroads," which appeared in the Chicago *Tribune* of May 31, voices proper interest in a problem which concerns the welfare of the general public and the prosperity of the entire country in a degree more vital than does any other present issue. The railroads are, by nature of the service they perform, public institutions, and as such the public should be most deeply interested in their prosperity and in their correct management. This does not necessarily mean, however, that government ownership of railroads can be regarded as a satisfactory or desirable solution of the problem. Any plan for the settlement of the situation must recognize certain rights, not only of the public and of the shipper, but also of the railroad owner and the railroad employee. The interest of each of these classes can be best served only by a broad and logical consideration of the facts. Controversies so far have been marked by the selfishness of one faction as opposed to rights of any other interest. The railroad employee is constantly demanding higher wages and shorter hours largely because he thinks that he can get them through the medium of organized labor and not because he thinks he earns them, or because he thinks the railroads are in position to pay them. The railroad owner has frequently taken advantage of his position by the employment of questionable methods of financing and unjust methods of operation. As a result he has reaped a harvest of public condemnation which is no less inconsiderate. The shippers and the general public are constantly demanding better and more costly service from the railroads and lower rates in addition, with apparently no more reason than either the owner or the employees had for their acts. In short the attitude of each faction is based largely upon selfish motives and the result of such a process, if persistent, is certain to be disastrous.

As one who has been in railroad service for many years I cannot persuade myself that government ownership of railroads would serve as a panacea for all the present ills and on the contrary it would probably introduce new defects as serious as those which it might overcome. The working conditions and wages of railroad employees compare favorably with those of any other industry. The rank and file of these organizations is made up of men generally from the middle classes, strong in brawn and sturdy in their love of country and home. Now, that their wage and working conditions are generally favorable, they have an opportunity to wield an influence in a bigger, broader way in helping to solve the railroad question. I believe a large majority of railroad employees would prefer to see the railroads remain under private ownership, and I believe if this question is properly presented to them they will assist in solving it in a way most satisfactory to the country's best interests. The railroads must clean house and turn in the light of day. Any calm view of the subject must disclose the fact that no interested faction is wholly blameless for the present unsatisfactory condition. Each interest has been contributing to the causes which are driving the railroads into a tight place. Is not it about time to begin an earnest process of getting together and working out a solution in the terms of which all who are fair minded might concur? To accomplish such purpose there should be

First—A cessation of demands which mean added expense. Second—A united effort to get at all the facts. Third—A willingness by all parties to apply the remedy which a study of the facts discloses.

It is true the factors involved are many and complicated, but they can be worked out and applied if the subject is properly approached. The railroads mean too much to the success and prosperity of every industry and of each individual in the entire country to be made the prey of financiers, politicians, labor unions, shippers or any other interest for selfish purposes. The cost of such an investigation on the most elaborate feasible scale would involve only a slight tax upon the interested factions, and the conclusions could be placed before the public with a reasonable assurance of a square deal for all those who are concerned. W. M. Whitenton.

OPERATING OFFICERS' SALARIES

Chicago, Ill., June 9, 1914.

To the Editor of the Railway Age Gazette:

Your recent notice of a wage dispute between the western railroads and their engineers and firemen again brings forward a point which has heretofore been given very little consideration.

For some reason the engineers have always contended for an arbitrary between their rate of pay and that of the conductors. The public, and everyone else, has apparently acquiesced, up to the present time, in this arbitrary. Whenever the engineers are granted an increase in pay, the conductors come forward in their turn, and among other things, call attention to the fact that the arbitrary difference between their rate of pay and that of the engineers has been made too great. Subordinate railroad officers, although interested as to the ultimate outcome of such cycles of wage increases, are beginning to be more concerned as to their own pay.

If an arbitrary is generally allowed between the engineers and conductors, surely it should be generally conceded between the officers and the engineers. No one in possession of his normal faculties will refuse to admit that a superintendent is worth 200 per cent. or 300 per cent. more than an engineer. Where, therefore, is the justification in paying engineers almost as much as superintendents and officers of equal rank, and more than officers of inferior rank? Officers are not generally dissatisfied with their rate of pay, but their self respect demands an arbitrary between themselves and the engineers.

In presenting estimates to arbitration boards of what proposed wage increases will amount to, no statistics are ever offered showing how much will have to be added to the total proposed increase for the purpose of raising officers' salaries in order to prevent them from being less than those of their subordinates.

From a mercenary standpoint, railroad officers might say that, if the railroad treasuries were to be promiscuously looted, they might as well enjoy a share of the loot before the cataclysm. They could justify the claim that they would merely be moving forward the date of the final catastrophe; they would merely be getting the benefit of higher pay before their positions were given to favored politicians.

Railroad officers, however, are not built that way. Doubts as to whether there is any loyalty left in the business world at the present time, do not apply to this field. They have a certain recognized degree of intelligence, however, or they would not be holding the positions which they do. They will never descend to organized agitation, but there is a latent danger in the present situation, brought about solely by economic laws, and that is the fact that the dividing line may soon appear, when other occupations will be more attractive to railroad officers because of equal or greater pay for less responsibility; and with more self respect. Operating Officer.

Government Ownership of Railroads and Public Utilities*

The Effect that Would be Produced on Government by Government Ownership and the Effect on the Industry

By Logan G. McPherson

Lecturer on Transportation at the Johns Hopkins University

Political government originally had its basis in combination for offense and defense. It is not a direct instrument in the production of the wealth by which it is maintained, but collects taxes for its maintenance. Although one state and another at one time and another have engaged directly to a greater or lesser extent in the processes of industry and commerce, a prime distinction between the political activities and the economic activities is that the former are not engaged in the production of wealth, while the latter are.

The mechanism of industry and commerce, money, instruments of exchange, banks, bank deposits, deeds, leases, the contractual relations between employer and employee, landlord and tenant, are the product of an evolution that has been subject to limitations of a different nature and in a measure apart from those that have affected governmental development. The underlying effort of all industry and commerce is to make "two blades of grass grow where but one grew before," or at least to see that "a new dollar is returned for the dollar that is expended." The political government has been under no necessity of making its activity immediately productive. To it, making both ends meet means no more than the levying of taxes sufficient to meet the expenditures. Many governmental organizations having the taxing power, including even some of the national governments, in recent years have seriously had to consider whether the economic sources of taxation could stand the further strain necessary to provide means for desired expenditure. In many cases projects have had to be abandoned.

The science of political government has been the development of many centuries; the science of economics, which deals with the production and distribution of wealth, is little more than one hundred years old. The first book that deserves to be considered as a scientific treatise on political economy was published in the same year that the United Colonies declared their independence of Great Britain. Agriculture had been the chief industry of nearly all nations; the use of coal had hardly begun; there was but little organization of manufacture, which was virtually all the product of handicraft.

The present Constitution of the United States was adopted, the government under which we now live was established, before that use of steam which is the basis of our industrial and economic status. It was another half century before there came into anything like general use the art of double-entry bookkeeping, the development of which has alone made it possible to ascertain with definiteness whether a dollar expended brings a dollar or more in return.

Now this is an important fact, the underlying fact in any consideration of individual wealth, of partnership wealth, of corporate wealth, of national wealth. If the individual spends more than his income he suffers material loss; continuance in this course will make him a bankrupt and finally a pauper. If a firm or a corporation is able to produce year after year only a loss instead of a profit, a deficit instead of a surplus, it must ultimately become bankrupt and go out of existence. This means that its capital has been dissipated, and capital is the surplus of past production which is needed that there may be future production. It is likewise with the nation. If the total of the production of a people does not exceed the total expenditure, that people will stagnate and ultimately the nation will decay.

This leads to the perception that not only must every dollar expended bring a dollar or more in return, but that all of that return must not be immediately consumed. Part of it must be utilized in the provision of the means for further production; that is, part of it must be utilized as capital.

Now it will hardly be denied that the mainspring of that activity which has led to advance in the political government and the mainspring of that activity which has led to advance in the economic status mainly have been set in action by selfishness. The feudal barons and their followers fought to protect themselves and to extend their sway. They were subdued and welded into nations by the conquerors who fought for power. After power was attained the conqueror sometimes continued to be a despoiler, but often he became an upbuilder. Even Napoleon said that there could not be lasting power without justice. Even our revolutionary heroes were not entirely altruistic in fighting to achieve the political independence of this nation. They were fighting for political freedom for their own benefit.

The endeavor to obtain from each dollar expended more than a dollar in return was orginally prompted by the desire for gain, the desire for gain on the part of the individual. But as monarch after monarch after attaining power has given proof of his desire to bring about improvement in the lot of the people, so also have merchant and manufacturer after success in the struggle for economic independence given much of their effort to bettering the conditions of their fellowmen.

The science of political economy, which treats of the way that the world makes a living, is anything even as yet but an exact science. There are not as yet satisfactory and accepted definitions of such fundamental terms as wealth and capital. Theories of value, of wages, of profit, and of interest, are still in dispute. But in the material world men keep on working for wages and salaries and profits, many of them with an interest in the work that transcends the reward, but more perhaps because of the reward. Merchants, manufacturers and bankers play their parts, many with motives above that of the desire to gain, but still perhaps in the overwhelmingly greater number of cases the desire for gain is the impelling motive.

The desire for profit means that for every dollar expended there must be obtained more than a dollar in return. Were it not for this result there would be no accumulation of capital and the processes of industry and commerce would stop. This desire for gain leads on the whole to the employment of those who are best fitted for their tasks, to the weeding out of the stupid, the lazy, the intemperate. It leads on the whole to the adoption of new inventions and appliances through which production can be more economically effected, and to production at the best adapted locality.

It is peculiarly the function of the banker to see that money is not invested except where it will bring return, and this has led to the scrutiny of the security, of the integrity, of the ability, and of the habits of those who apply for capital. The channels through which capital is conserved, through which the processes of industry and commerce are maintained and advanced, all tend to the elimination of the unfit, to the rise of the capable and honest to the positions of direction and responsibility, to the relegation of the less capable to subordinate positions in accordance with their capability. It is not only those who work and save and invest who have an immediate interest in the return of more than a dollar for every dollar expended, but the whole nation has an interest, for it is alone from the product of those who work and save and invest that the vast expenditures of the government, the expenditures of the nation, the state, the counties and municipalities can be met; and it is alone from the product of those who work and save and invest that are supported the infirm, the decrepit, the physical and mental de-

*A lecture delivered at the Johns Hopkins University.

fectives, the ne'er-do-well, the unemployable, and the criminal. In the world of business the man has no place above the dollar unless he can demonstrate that he is worth more than a dollar. The business of the country is carried on by those who demonstrate that they are worth more than the dollar, and it is they who support those who cannot demonstrate from an economic standpoint that they are worth even so much as a dollar.

What business is and what business does are, however, not clearly understood by all. Indeed they are widely misunderstood. There are comparatively few who understand that because a man has a large fortune it does not necessarily mean that men without such fortune are necessarily suffering deprivation; that on the contrary the control of the large fortune may mean investment in mines, mills and factories which give employment to thousands, provide the means for paying their wages, and produce the things of need to all people. It is not understood that, whereas large volumes of capital during the earlier period of our industrial and commercial development were frequently the result of the efforts of their immediate possessors who often had to work the harder the greater their fortunes, it is now almost invariably the case that a large volume of capital is formed of the contributions of many, even of thousands of investors, and is administered in their behalf by executives who frequently are not rich but have come to their positions because of demonstrated capacity for large-scale organization and administration. Thus the greater the extent to which the field of industry and commerce is occupied by corporations whose capital is widely distributed, the greater is the extent to which the field of industry and commerce becomes an industrial democracy with boards of directors chosen by vote of the investors, and with executives called to their positions because of their qualifications.

Obviously, it is those who are most successful in preventing the loss of capital who should be entrusted with its preservation, and those who are most successful in the use of capital who should be entrusted with its disposition. Only the few develop this ability, and they only through the experience and practice which lead to successful initiative and successful direction of the increasingly complex processes of industry and commerce. Enterprise, wide information, breadth of grasp, watchfulness of detail, judgment, the ability to choose capable men and give them constant direction are necessary. The very diffusion of thrift and energy, the increasing utilization of machinery, roll up capital from various sources in volume too large to be successfully utilized except by those of great grasp and administrative capacity.

As a rule it is the industrious, the thrifty, the prudent and intelligent who save by living within their income and avail of opportunities for the wise investment of their savings. It is such who under proper restriction ought to have the franchise in the industrial democracy.

The political democracy is differently constituted. In the United States every male adult, with the exception of certain defectives and criminals, has or may obtain the political franchise. There is neither property nor educational qualification. The high average intelligence of the American citizen has been the source of justifiable pride since the foundation of the nation. The United States has safely ridden the breakers but still there have been deplorable mistakes. Of recent years some of the southern states have established an educational and property qualification for the franchise. There is hardly anyone at this time who does not think that some such qualification ought to have been established immediately after the war before all the emancipated slaves were admitted to the franchise. Just as one example of the continuing effect of the precipitate action of that time may be cited the fact that in the city of Indianapolis, one of the fairest in the land, where social and business life is on a high plane, there are 15,000 negroes and these 15,000 negroes hold the balance of political power in that city.

Wherever the political boss has established supremacy it has been because of the great body of the ignorant and unscrupulous, whose vote has been gained, not because of appeals to their citizenship, but through the lure of immediate appeal to personal desire. This selfish appeal is not alone of the individual politician who seeks to obtain votes for himself. It is exemplified in the appeal which state legislatures and even the national legislature make to communities and to large organizations for the sake of retaining the hold of the party in power.

This country has many reasons to be proud of its government, but the methods by which it has expended the public money do not constitute one of them. The folly that has characterized many of the congressional appropriations for the improvement of waterways to enable them to carry traffic that never by any possibility will come to them, for the erection of public buildings for the purpose of enhancing the value of the real estate of a struggling town, and the ease with which millions after millions have been added to the pension-roll, causing its aggregate to increase after the time when in the nature of things it ought to decrease, are known to all men. Such appropriations mean expenditure that is in utter disregard of sources of income. All sorts of committees initiate all sorts of expenditures and the wherewithal comes from taxation. States and municipalities add recklessly to the burdens of taxation, and yet the administration of most of our large cities is so far inferior to that of cities of corresponding size in Europe as to make their condition a reproach. The political administration in this country, whether of the nation, the states, or the municipalities, has to this time shown little regard, if any, for making even one blade of grass grow where one grew before, of obtaining even one dollar in return for the dollar expended. The financial record of the political government of this country is of appalling wastefulness.

As the franchise in this country is held by virtually all male adult citizens, it is but natural that great bodies of voters should seek to obtain through governmental action benefits which they have not been able to secure for themselves. Manufacturers sought advantages through protective tariffs; railroad promoters sought vast grants of land. It has not been many years since it was the common belief that legislation was controlled by the men in charge of the large business interests and oftentimes by unworthy methods. Admitting that there was a large measure of foundation for this belief, it alone is a sad commentary upon the quality and the integrity of the men elevated to public office by the votes of their constituents.

Now the tables are turned. It is the organizations of great bodies of voters, such as the trades unions that have lobbies at the federal and state capitals, that negotiate with a candidate before his election as to what he will do in return for their vote, that send telegrams of congratulations to governors when they approve bills instigated by the labor organizations. In all such instigation there is no effort to cause two blades of grass to grow where but one grew before, to bring a dollar of return for a dollar expended.

It would seem, therefore, that the political democracy with universal male franchise and the industrial democracy composed of those who have contributed to the aggregate of capital are not pulling together. Even if the extreme assertion were to be admitted that the one is more concerned with the man and the other the more concerned with the dollar, there is yet never to be forgotten that the man is important and that the dollar also is important, that without sturdy and efficient men there could not be the production of wealth and that without wealth there could not be sturdy and efficient men.

That there have been evils and that there are evils in the industrial democracy as well as in the political democracy every one knows. As the leaders of the political democracy have often sought to gain and retain political power through wasteful expenditure of the money provided by taxation, so also have leaders of the industrial democracy often sought to gain wealth through the ruthless exploitation of those who work for wage or salary.

Would the problem be solved, would the condition of the country be advanced, if the control of the processes of industry and commerce were placed with the political democracy to be immediately directed under the auspices of the office holders elected by the political democracy instead of the executives chosen by the industrial democracy? There is the alternative known as public regulation. There is an old saying that if you

want a thing done right you must do it yourself. That dictum has a limited application to the things done wholly by oneself in one's own interest, and frequently does not hold good even within this limit. When it comes to administration, and especially to the direction on a large scale of the processes of a large organization, it is much easier to pick flaws than to perform, to criticize than to do, and this is the principal reason why it is better that the large business of this country be regulated by the people than administered by the people. The army and navy are large organizations to be sure, and are administered by the government, but they are not concerned with obtaining return for the money expended. The condition of the army at the beginning of the Spanish war did not afford a high testimonial to the efficiency of its administration, and it has often been claimed that there is log-rolling in connection with the navy yards as well as in appropriations for government buildings.

As has time and again been pointed out, when a large organization is under the control and administration of a governmental body that administration is affected in many ways by political influence. The vigorous efforts of many years to place the employees of the federal government under the civil service have only been successful in part; nearly every governmental officer or employee with a salary of over $2,500 a year is likely to lose his place with a change of administration. When fault is found with a particular process of governmental administration there is likely to be a wrangle between the party in power that is responsible, and the party out of power that is looking for every opportunity to find fault. The governmental processes are so involved and there is such division of authority that definite responsibility is often, if not always, extremely difficult to place. The appeal is to the voters. If they uphold criticism to the extent of displacing the party in power there is a change of administrative officers, oftentimes a change in general administrative policy, and frequent changes in administrative policy and the personnel of administration usually do not bode well for efficiency.

On the other hand, a public regulatory body, especially an appointed commission of the type now exemplified by the Interstate Commerce Commission and the railroad and public service commissions of the many states, is far less responsive to political influence than a legislative body whose members are elected for short terms and persistently seek re-election. Such a body may be an efficient critic and censor of the conduct of a business organization, even although its own organization be defective and poorly administered. With proper authority it can bring pressure to bear upon those actually charged with the administration of business organizations that will cause them to remedy abuses such as a political organization would have great difficulty in remedying within its own ranks.

The country is not at this time immediately confronted with the proposal that the government take over the administration of all business. It is, however, immediately confronted with the proposal that the government take over and administer the telegraph and telephone systems, and the proposal that it take over and administer the railroads has become a subject of wide discussion.

If the railroads were taken over by the government it would be inevitable that no end of questions would come into politics that are not now subject to political decision. It is almost inevitable that the tremendous voting power of the rank and file would cause their votes to be sought by politicians with various promises of increases in pay and easier working conditions. The party in power by having control of the railways would have control of the nation. Should there come to the presidency a man with the ambition to establish a dictatorship, his pathway would be the less difficult.

It is impossible that under governmental ownership the railways would be manned in any appreciable degree by other than the employees now in their service. There likely would be more or less change in the officers charged with administration and management, but there could not be a great deal of change even in these because men capable to fill such positions are now all too few. The great body of under officials and employees would of necessity have to be constituted at least for a time almost entirely of the same men by which it is now constituted. Responsibility for their performance would rest ultimately with governmental officials elected by the people instead of with officers owing their positions to their efficiency and retaining their positions only so long as their efficiency continues.

The experience of the country with appropriations for river and harbor improvements and for public buildings gives ample reason for belief that if the building of new railroads were to become a matter of congressional appropriations the congressmen of one part of the country would endeavor to get railroads for their district, and the congressmen of other parts of the country would endeavor to get railroads for their districts whether there were economic justification for their construction or not; and there would ensue interminable log-rolling and wasteful appropriations.

In recent years there have been debates in the houses of Congress even as to railroad rates applying in one section of the country as compared with the rates in another section. If the government were to take over the railroads, it is almost inevitable that the shippers of a particular section of the country would cast their influence for the candidate who would endeavor to obtain rates that might give them an advantage in competitive markets. The shippers of other districts would adopt similar methods in opposition. The result would be that the freight-rate structure of the United States that has been undergoing a gradual adjustment to the needs of commerce would be thrown into confusion. That this is not idle surmise is demonstrated by the fact that the legislature of more than one state has forced its railroads to make rates for intrastate traffic solely for the purpose of giving shippers of the respective state an advantage over their competitors of other states.

As has been said, the material welfare of the people of a nation can only be served when two blades of grass are made to grow where but one grew before, when for a dollar expended a new dollar and more is returned. The conduct of industry and commerce under private enterprise does not always serve this end. There are losses in business and there are failures in business, but the loss falls upon the immediate investor.

It has been the theory of this country that the expenditure of the government should serve the needs of the people in ways in which they cannot so well serve themselves. Therefore have been sanctioned the expenditures for offense and defense, for maintaining order, for popular education, and other purposes in which immediate pecuniary return is not expected or desired. Such purposes are properly served by taxation for the common good. If, however, the government enters upon the control and administration of the processes of industry and commerce it takes it upon itself to see that two blades of grass must be made to grow where but one grew before, that for a dollar expended a new dollar and more must be returned. The nearest approach that the government now makes to conducting a business enterprise is in the distribution of the mails, and the post office department has never even been self-sustaining. A recent postmaster general reported that the deficit in the operation of the post office department had been turned into a surplus, but that report was arrived at through distorted accounting as reprehensible as any ever undertaken by financial buccaneers in railroad exploitation.

In so rich a country as the United States the burden of taxation has not fallen heavily upon the people, although it has been asserted that if the aggregate taxation, direct and indirect of the federal government, the state governments, the municipalities, and other political entities having the taxing power were assigned per capita, the proportion would be found to be greater than in any of the heavily taxed countries of Europe. If the government were to take over and operate the railroads with the same degree of business inefficiency and business laxity that has characterized other phases of its administration, it would not be many years before taxation would bear severely upon every taxpayer. If the government were to take over and operate the railroads, the express service, the telegraph, and telephone service, it would be the largest purchaser of coal, of iron, and steel, likely of lum-

ber, and other of the great commodities of commerce. Its payrolls would be increased by over two million employees. With their families this would mean that over ten million persons, or one out of every ten in the United States would be directly dependent upon governmental disbursement.

To know from what sources money is received and in what direction money has been expended, and therefore to know whether or not a new dollar is being returned for every dollar expended, is needed an exact and definite system of accounts that is necessarily the more elaborate the larger the scale of operations, and the more intricate the greater the variety of the processes. The Interstate Commerce Commission in co-operation with officers of the railways has devised a system of accounts for their operation that is a highly developed achievement and that, moreover, is continuously undergoing improvement.

That which the people through this regulatory body have been able to do in bringing to the clear light the receipts and expenditures of the railways, they have never been able to bring about for the receipts and expenditures of the political governments through the officers they have elected to administer those governments. It is in but few states that the accounts of moneys received from the people and expended for the people are kept scientifically and intelligibly. The wastefulness of the expenditure of the moneys received from the taxpayers of the large cities is a by-word and the so-called accounting systems of most of these cities are beneath contempt.

Many of the public regulating bodies during their earlier years were outspoken champions of the people against the corporations. They not only were professedly partisan in opposition to the large business interests of the country, but were vindictive in public utterances against the business interests, and especially against the railways. But there are always two sides to every question. With the continuance of their service the public commissions are gaining the experience which the better enables them to understand not only the evils in business which must be removed but the beneficent activities of business which must have strength and support. On the other hand, those engaged in the administration of business and especially of the great corporations, have come the more clearly to understand the line between business energy and undue aggressiveness.

Competition was supposed to serve the public good by putting each man on his mettle, by allowing him to obtain benefit from the social organization to the extent that he contributed to the benefit of the social organization. When the competitors joined in combination, whether of labor or of capital, there was a modification of competition. Intsead of competition between individual and individual for employment there came a struggle between trade union and corporation as to the division of the returns from the product which is the joint result of labor and capital. The strike and the boycott have led to mediation, conciliation, and arbitration, through which it has come about that boards of arbitration chosen by the disputants or by the government or in part by one and in part by the other determine the questions at issue. This procedure is a step away from pulling apart and a step toward pulling together for the common good. In the arbitrations the contentions, the arguments and the facts of the disputants are brought to the light. This alone helps to a better understanding that itself ought to lead to the more peaceful, amicable and well-considered adjustment of future disputes.

This is one of the ways in which the whole people are gaining that understanding of the various phases of industry and commerce which may perhaps in time fit them to control and to direct the industrial and commercial processes in the same way that they now control and direct the processes of the political government, or better it were to say in the way that they ought to control and direct the political government through the means at their hand.

In the ideal industrial state depicted by Edward Bellamy in "Looking Backward," it is the whole people who do control and direct the processes of industry and commerce as they do the construction and maintenance of the highways, public sanitation, the channels of communication and other parts of the social mechanism for the social good. In that ideal state of Bellamy, which perhaps is typical of the ideal of every one who hopes for the fullest attainment of the brotherhood of man, there are neither physical nor mental defectives because, under the conditions of living and of marriage, such could not be born. After a preliminary period of education from childhood through youth carefully adapted to develop the physical and mental characteristics of the individual, each boy and girl is assigned to a round of preliminary service, including work with the hands in pursuits that at the present time are considered to be those of the drudge and the menial. But in Bellamy's state there is no drudgery, for all recognize that all work is service for the common good.

After the preliminary round of service the youth is assigned to the vocation for which he has manifested particular aptitude. By the time he is forty or forty-five years old his contribution to the material welfare of the state is deemed sufficient to justify his retirement and the spending of the remainder of his life in self-cultivation, except that after five years of such leisure and study in which his view has been broadened, he may be called upon to serve as one of the directors of the industry in which he spent the larger part of his service. The directorate of each industry determines the kind of product as nearly as possible in accordance with the wishes of the people, the places of production and the quantities of production sufficient to meet the needs of all of the people.

A national board composed of members selected from the various industrial boards determines questions of national concern, among others the amount of the surplus of production that shall be used as capital for future production. In this state every one puts forth his best efforts at all times because of the satisfaction that lies in doing the best that can be done and in the knowledge that thereby he best serves the social welfare. It is so with the inventor, the composer, the writer, the man of affairs, with everyone in every vocation; the satisfaction of doing is the only motive, and approbation of their fellowmen the reward.

There is probably no one who would deny that the attainment of such a state would be the transcendent achievement of man. There are apparently those who think that such a state could immediately be brought about by abolishing present institutions and establishing such a social state forthwith. The demonstration of the futility of such a proposal leads, however, to the perception that the social, the material, and the spiritual progress of man is toward just such a state as Bellamy depicts. The pressure of the political forces, of the economic forces, of the spiritual forces, is molding men and the institutions of men into fitness for such a state. Great as has been the progress the goal is as yet far beyond and it cannot be reached except step by step along the path along which we have come step by step.

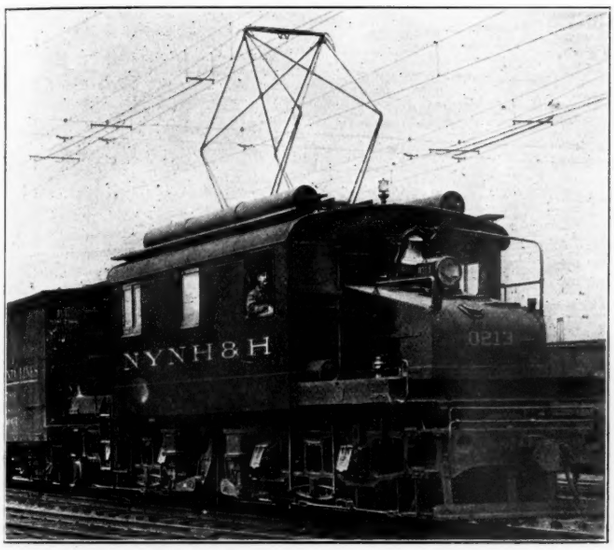
The entire country is in a ferment of economic education. The theory of our government is that its institutions rest upon the will of the people, but that it shall be determined only after thorough popular discussion and deliberation. It is to be hoped that the present discussion will not be cut off by a precipitate decision on the questions at issue but will continue until there is thorough understanding on the part of all men of the economic transition which has been taking place during the last half century. When that understanding has been reached it may be that the organization of business will have become so adapted to the service of the whole people that there will be no case of governmental control versus private enterprise, that the work of all the people for all of the people will have attained that development and that recognition which may lead to the realization of Bellamy's ideal state.

All Steel Cars in Great Britain.—A fireproof train built almost entirely of steel is being constructed by the North-Eastern Railway for service between London and Edinburgh. The train, which will be the first of its kind in the United Kingdom, has been designed by the chief mechanical engineer to the company.

Electric Switching Locomotive on New York, New Haven & Hartford

Sixteen of These Locomotives in Service, and Each Is Capable of Doing the Work of Two Steam Locomotives

In March, 1911, the first electric switching locomotive on the New York, New Haven & Hartford was placed in operation at Stamford, Conn. In August, 1912, the first switcher started to work in the Westchester yards; in September, 1912, the first in the Oak Point yards in float service, and in August, 1913, the first began its operation in the Harlem River yards proper.



80-Ton Baldwin-Westinghouse Electric Switching Locomotive on the New Haven

The Oak Point yard is the terminal where all the cars on flats destined to the New England states are unloaded.

Ease of control, the elimination of stand-by losses and those that are necessary where coal and water are used, the elimination of freezing up in cold weather, are all features to be credited to the electric locomotive. Six single-phase electric locomotives do the work of approximately twice that number of steam locomotives formerly used. Eight electric locomotives are sufficient for practically all of the switching work between Stamford and the Harlem River. These are kept in service 24 hours a day. The electric locomotives handling the work between Westchester yard and Harlem River for a given month made 38,000 locomotive miles and consumed approximately 896,000 kilowatt-hours of electrical energy at the locomotive. During this same period, the six locomotives handled approximately 65,000 cars, which had a total weight of approximately one million tons. Practically all of these cars were transferred from floats. All of the heavy freight tonnage mentioned above is handled within the corporate limits of New York City, and the elimination of smoke by the use of the electric locomotive is another advantage.

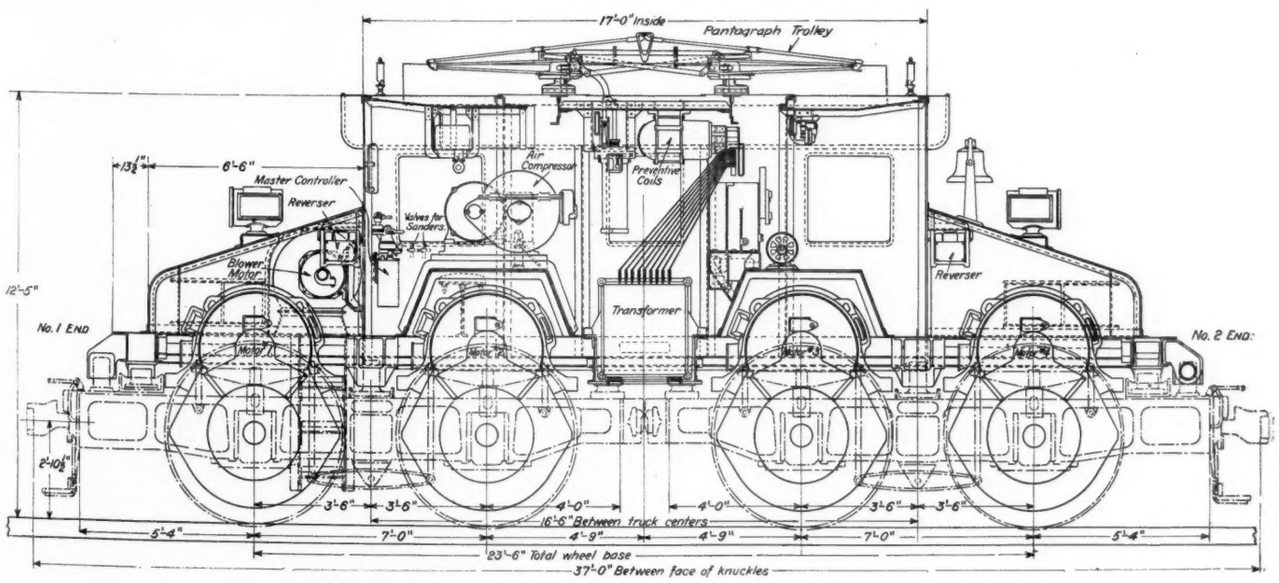
The 16 switching locomotives in service are equipped with four Westinghouse 125 h. p., 25-cycle, single-phase motors and unit switch control. These locomotives each weigh 80 tons and exert a maximum tractive effort of 40,000 lb. The rated hauling capacity is given in the accompanying table:

RATED HAULING CAPACITY, NEW HAVEN SWITCHING LOCOMOTIVES

	Number of cars, each weighing 45 tons with load	Max. speed, m. p. h.
Straight level track	67	8.5
½ per cent. grade	28	8.1
1 per cent. grade	17	8.1
2 per cent. grade	9	8.1

The locomotives are guaranteed to exert a maximum tractive effort of 36,000 lb. for about three minutes at speeds up to 6 m. p. h., and a continuous tractive effort of 14,800 lb. at a speed of 11½ m. p. h. It is not expected that the maximum voltage on the motors will be reached in ordinary switching service, but it is advisable when climbing grades or on longer runs in the yard. The average operating potential is estimated to be 190 volts. The hour rating corresponding to this voltage and current of 900 amperes is approximately 125 h. p. per motor. The locomotives are of the 0-4-4-0 articulated truck type with central cab. The pulling and buffing strains are taken by the truck frames, which are joined at the center of the locomotive by a drawbar. The frames are placed outside the wheels, and are steel castings of the usual bar type, having straight pedestal and removable gibs.

Each end of the armature shaft is equipped with a pinion



General Arrangement of New Haven Electric Switching Locomotive

which meshes with a steel tired gear. These gears are mounted rigidly in a quill which surrounds the axle with a clearance sufficient to allow vertical wheel play. The quill is carried in journals formed in the motor frame. The motor tractive effort is transmitted from the gears to the wheels through helical springs, rigidly attached at their ends to the wheel center and gear center respectively. With this arrangement, the motors are spring supported, and the center of gravity of the locomotive is at a suitable height above the rail.

As the locomotives operate only on the New Haven tracks, no provision has been made for collecting current from a third rail. They were designed to traverse 20 deg. curves.

The frame which carries the superstructure of the locomotive is built up of rolled shapes and plates with the exception of the cab bolsters which are cast steel. It is supported on each truck frame by spring-loaded friction plates at four points. Two of these points are located at the inner end of the frame, one on either side, as far from the longitudinal center line as possible; the other two are located at the outer end of the frame, and placed close together on either side of the longitudinal center line. The trucks have center pins also, but these carry no weight and are simply to keep the superstructure in proper alinement with the trucks. One of the center pins is given sufficient longitudinal play to compensate for the backlash existing between pulling and buffing positions. The main driving wheels are 63 in. in diameter and have 56 in. cast steel spoke centers. The tires are held with a shrink fit and shoulder. The cab is built of steel plates with the main portion 17 ft. 8 in. long. An operating equipment is placed at each end.

The brakes are Westinghouse EL double-end, with train connections; a hand brake is applied to one truck.

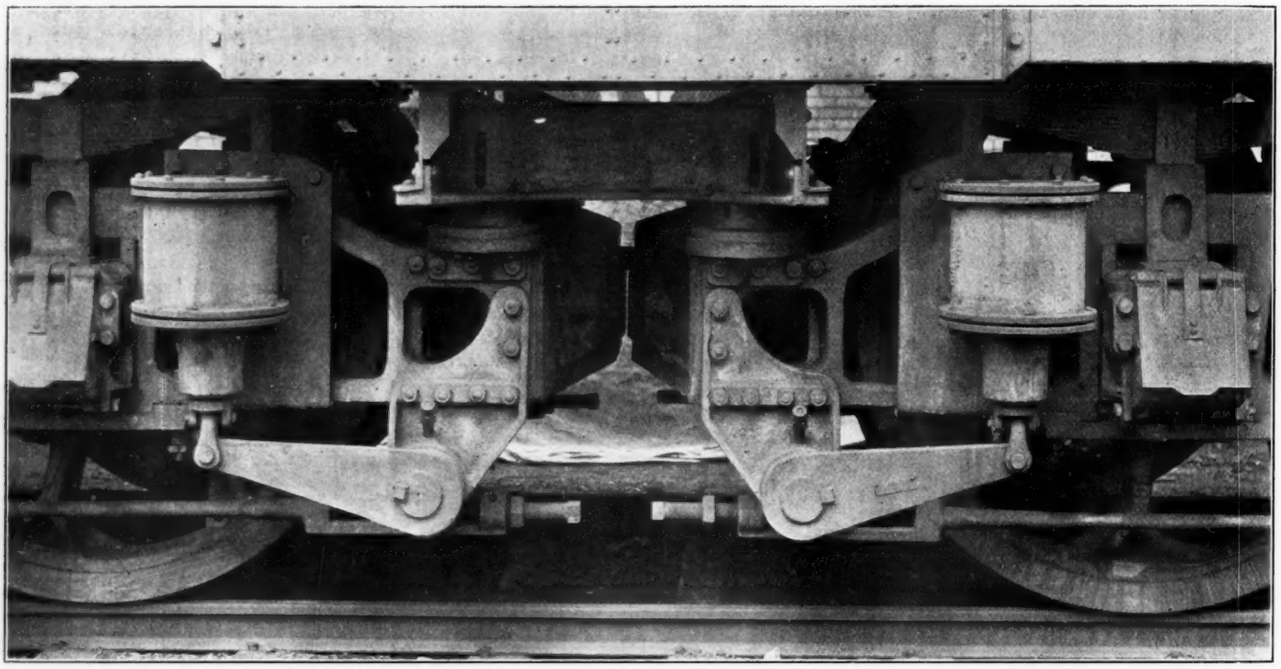
The motors are connected in two pairs, so arranged that the two motors of each pair are permanently in series, while the two pairs are permanently in parallel. The speed regulation is obtained by connecting the motors to different taps on the secondary winding of the transformer in the same way as is done on all the previous New Haven locomotives. The control is very simple because the locomotives are not required to operate on direct current. The switches are of the Westinghouse standard pneumatically operated type, using the compressed air of the braking system as an operating force, and a small 20-volt storage battery for actuating the magnet valves. The battery is charged by means of a small motor-generator set which consists of a single-phase motor and direct current generator.

The locomotives are controlled by a master controller located in each side of the cab. A locomotive has also been built in which a single controller in the center of the cab is provided for operation in either direction.

The more important data are given below:

Weights

Per driver axle	39,780 lb.
Mechanical parts	83,390 lb.
Transformer	6,000 lb.
Motor complete with gear and gear case and quill drive	13,585 lb.
Control equipment and details	10,675 lb.
Forced ventilating equipment	770 lb.
Air brake equipment	3,950 lb.
Total weight	159,120 lb.



Details of Connections Between Trucks on the New Haven Switching Locomotive

Mechanical Data

Truck wheel base, rigid	7 ft. 0 in.
Total wheel base	23 ft. 6 in.
Length between coupler knuckles	37 ft. 0 in.
Length of cab inside	17 ft. 0 in.
Length of hoods	6 ft. 6 in.
Width of hoods	5 ft. 0 in.
Width over all	10 ft. 3 in.
Diameter driving wheels	63 in.
Total height over cab roof	12 ft. 6 in.
Gage	4 ft. 8½ in.

A COMMITTEE ON RAILROAD ETHICS

The Chicago *Tribune* on June 5 published the following letter from F. A. Delano, president of the Chicago, Indianapolis & Louisville, discussing an editorial which appeared in the *Tribune* on May 31 on the reasons for the present critical condition of the railways:

If the admirably expressed and tersely put editorial from the Chicago *Tribune* correctly states the facts, and I believe it does, it is time for men who love their country—patriotic, forward-looking men—to do something about it.

Criticism from all sides has laid bare the facts enumerated, but we need something besides criticism. We are drifting towards government ownership, because those having the greatest share in the present form of ownership are becoming disgusted.

Under the policy which has existed in this country almost to the present time, railway building was encouraged without regard to needs, intelligent location or earning capacity. Capital

was encouraged to build railroads, although in many cases they were so built that they could never be made to pay; and yet even to this day, although we have for 26 years had a commission with large administrative powers, we depend chiefly on competition to determine rates, facilities, time schedules, etc. In mercantile experience or in manufacturing, the unwisely projected or the badly located venture goes to the wall and no longer continues as a menace to other enterprises; but not so a railroad. In only two states of the union has there been a check placed on useless railroad building, wildcat projects, blackmailing schemes; and yet, the worst practices today, practices which the Interstate Commerce Commission could without doubt stop at once by executive or administrative orders, are practices which have crept in and become custom in the battle for existence between these parallel and competing lines.

As a nation we have attempted to cling to a dual system of regulation on the one hand and unlimited competition on the other; and when railroad men have tried to get together to abolish evil practices—trying to bring about a better enforcement of the law and the spirit of the law—they were none the less enjoined as conspirators.

But this is neither the time nor the place for criminations and recrimination. The *Tribune* has correctly diagnosed the situation. It is time to arouse ourselves. The Interstate Commerce Commission finds itself overworked and unable to cope with the situation, and it appears to the writer that the time has come for railroad men themselves to take hold. We must do as the bankers have found it necessary to do; they do not depend upon the comptroller of the currency and his examiners to find irregularities—that method was fully tried and found sadly wanting—but they have added, in Chicago and in some other large cities, their own corps of examiners to report to the clearing house.

Railway officials object to being told that it was their business to cry a halt in the New Haven situation before things had gone too far, and yet all of them will admit that great and incalculable harm has been done to all by the methods of Mr. Mellen. Shall we allow this sort of thing to go on; shall we permit one man, be he insane or unscrupulous, to besmirch the reputations of the remainder? The old employers' guilds of the middle ages were wiser than that. Surely if we have a reputation to sustain we cannot afford to have it ruined. Certain standards of professional ethics must be established and enforced by a committee of such character and authority that its recommendations will carry.

Such a committee would soon have the confidence of the Interstate Commerce Commission and state authorities, and in time be helpful in curing practices which the commission probably thinks should be cured, but does not know how to approach. Mr. Brandeis has pointed out serious causes of loss, leaks which should be stopped, rates so low that they amount to special privileges. These are not new discoveries; the serious fact is that they have long been recognized, but under the present method of management there has been no cure for them. What shall we do about it? Shall we try to cure the trouble or shall we allow things to drift, the slow but inevitable drift to government ownership, even though we may foresee in that drift the wreck of our republic?

FREDERIC A. DELANO.

VENTILATING THE UNDERGROUND RAILWAYS OF LONDON.—Under the old method of ventilating the tunnels of the Underground railways in London, the air was withdrawn by means of an exhaust fan. By the device now being installed at the Edgware Road, Euston, and at the new Embankment station, constant supplies of air will be pumped into the tunnels throughout the day and night. Ordinary air is passed through a washing screen which extracts the impurities, the requisite humidity is next imparted, a proportion of ozone added, and it is then sent into the stations at the rate of 25,000 cu. ft. per minute.

LOCAL FREIGHT TRAIN SERVICE

By J. L. Coss

Assistant Chief Despatcher, Chicago, Rock Island & Pacific, Haileyville, Okla.

The local freight is one of the most important transportation problems. The patrons of the railway from the millionaire wholesaler down to the ten-cent store man, are watching and commenting on the local service. The storekeeper at the crossroads town wants his small shipment just as much as the carload dealer wants his. To deliver the L. C. L. shipments promptly and in good condition keeps down criticism, and above all things cuts down the claims. The additional and reasonably regular train for the accommodation of traveling salesmen enables them to make several towns in one day which will increase the merchandise sales of the jobbing houses, and this will undoubtedly increase the carload business.

The freight houses and transfer platforms where the local is made up must be in charge of men who understand the handling and stowing of freight. All freight should be loaded in station order so that the train crew can unload it promptly without searching the cars over, and when unable to locate it, carrying it by. The loading or transfer force should see that any packages showing signs of having been roughly handled be recoopered and any bearing evidence of pilferage should have their contents carefully checked and a proper record should be made for future reference when claims are presented. The depots along the line should be provided with a freight house door the right height for cars and a gang plank long enough to reach from the car door to the freight house door in order that freight for inland towns and that which cannot be delivered on the day of arrival can be safely and easily placed in the house and likewise freight from the house placed in the car. Live agents, will as a rule, have an arrangement with the town draymen to be on hand on the arrival of locals, if the arrival time can be depended upon, and these men will handle a lot of the freight direct from the cars to the owner. When the locals arrive late and frequently at night, and the agent is not at hand to check and receive the freight, it is disposed of by the trainmen in the easiest way possible, usually being unloaded on the platform without protection. This of course results in extra handling, and when it is delivered, if at all, it may be so damaged as to be refused.

A local should not be made a tonnage train. The maximum tonnage should be handled by all engines whenever possible, but the local service cannot be performed to the best advantage if the engine is burdened with the full rating. Merchandise set-out cars should carry a minimum load of 3,000 to 5,000 lb., for as a rule the space at loading platforms is limited and if there is not an outgoing load ready for the empty car it may remain at the station for some time, resulting in extra handling in switching by locals and keeping it out of service when it may be needed on some other division. When cars are not needed for immediate loading, the home empties should be taken to some convenient place and stored, and the foreign empties hurried homeward.

The most important thing in the operation of local freights is the selection of the crews. They should be among the very best in the service, so far as the employees' schedules will permit, and by a little figuring and diplomacy on the part of the employing officer it can be arranged to get good, experienced men on these trains. They should be able bodied young fellows, weighing at least 150 to 160 lb. The conductor should be a man of more than fair education, not easily excited, polite in his manner, able to render his reports accurately, and one that would not be called lazy. He should also have some executive ability in order to secure the full support of his brakemen and the engine crew. The members of the crew should also be interested in the "Safety First" movement, because freight trains carrying passengers are always liable to accident caused by draw bars being pulled out, hard jars during starting and

stopping, etc. Exceptional care should also be exercised while switching at stations to avoid colliding with vehicles on crossings, laborers loading and unloading cars on industry tracks, children playing around the station grounds and trespassers in general.

The local should be considered in a class by itself and so treated if the purpose for which it is run is to be served. Ten hours or 100 miles is considered a day's work for a train and engine crew; and local freight divisions are usually made about 100 miles long with the expectation that crews can make the run in 10 hours. To produce the desired result the local should be scheduled out of the terminal at say 7 a. m., which is a convenient time for the trainmen to be ready to go and for any prospective passengers to take the train. The local should not encounter a passenger train or through freight at the first station out, as in case of some unavoidable delay to the local in the terminal an hour or more terminal overtime might result. The train should be made up of the short loads and merchandise cars, especial attention being given by the yardmaster to see that wrong cars are not placed therein and by the car men that all the cars are in good condition so that when the conductor checks the train he will not have to go to the office and advise that there is a wrong car in the train or that one must be set out on account of some defect, either of which may result in an hour's terminal overtime. This crew should do all station switching up to where it meets the opposite run, move all intermediate loads and as far as possible bunch through loads originating at way stations for through freights or drags to pick up without switching. The agents can be of great assistance in expediting the movement of locals by wiring the conductor in advance of his arrival as much of the switch list as possible in order that the crew may be informed as to the character and volume of the work and can arrange it so that work may be saved farther down the road in making set-outs and pick-ups. The agents, helpers and operators should be lined up to be on hand at the station on the arrival of the train and help out as much as possible. The conductor should be on the engine when approaching stations where there is switching to be done and by the time the merchandise cars have been spotted he will have had in hand the program of the necessary work and see that it is properly and quickly performed consistent with safety. After sizing up the situation, he should, however, advise the despatcher the approximate length of time he will be at the station in order that the latter may have some information on which to base his figures for the movement of opposing trains. As it is the general custom for local crews to take dinner at some convenient place the conductor should make this arrangement in advance and also notify the despatcher.

It should be considered above all things that the despatcher is the man at the helm and any advance information as to the prospective movement of or delay to traffic will enable him to fortify himself against delays of many kinds; wrong information given him may "knock down" all trains for several hours. He is just as interested in having trains move promptly over the division as any one. However, he should give the locals preference to the main track at stations, over drags and other similar trains, in order that the work may be accomplished as quickly as possible. If there is any of the old spirit, "Oh, it's the local, he will take care of himself," in a despatcher, it should be taken out of him as soon as possible. As the train moves along the conductor should see that the load in the merchandise cars is broken down so that the roll and jar of the train will not cause the packages to tumble around, thereby sustaining damage and making work for the claim department.

It must also be remembered by the officers that the train and enginemen who are handling the locals must be given some consideration; a dissatisfied employee is the worst enemy a corporation can have. The crew starting out at 7 a. m. for example, after having a good night's sleep and a wholesome breakfast, possibly at home, if at the home end of the run, are physically able to cope with a hard day's work and if they are reasonably sure that they will reach the other terminal within a day's work they will give value received. When local crews work regularly some of the men will carry their lunches, and while the others are getting their dinners at a restaurant, will have unloaded the merchandise, done some transferring to help out further down the line, or other work necessary to advance them and in reality little or no time will have been lost for dinner. When they arrive at the terminal at a seasonable hour and have a little time with their families in the evening they will feel more like starting out the next morning and doing another good day's work; a great deal more so than if they had dragged in the night before on the 16 hours, or possibly had been tied up on the road and had to start on the next trip about noon. A man cannot stand up to 14 to 16 hours' work on a heavy local for six days in the week and do the company justice. One or two tie-ups on the line each week, sleeping in cabooses, eating whatever they can get and working the full 16 hours on the road the remainder of the week not only cripples the men in their work but cripples the service to an alarming extent. The company is paying for service which it is not receiving. With such irregularity, men will lay off more often and the crews will be filled with inexperienced men.

It is often embarrassing to have to explain delays to shipments of fruit or groceries which have been on the road a week and have been set out miles from their destination on account of the 16-hour law, or a leaky engine. The latter cause may have been the result of inattention on the part of a section hand who was left to watch the engine when tied up away from the terminal, but such an explanation is a thin excuse to the man that is after the shipment. He cares nothing about leaky engines, the 16-hour law, derailments, etc.; it's the freight he is after and the road insists on his paying the freight charges regardless of when his goods are delivered. In regular local service regular enginemen and regular engines will be used and the engine crew will do a great deal of work on the engines while standing at stations waiting for loading and unloading of merchandise, for trains, etc., thus keeping the engines clean at least, which is a credit to any railroad. When the engines reach the terminal at a seasonable hour the shop force has ample time to do all the work reported and have it in first class shape for the next trip and thereby eliminating many engine failures on the road.

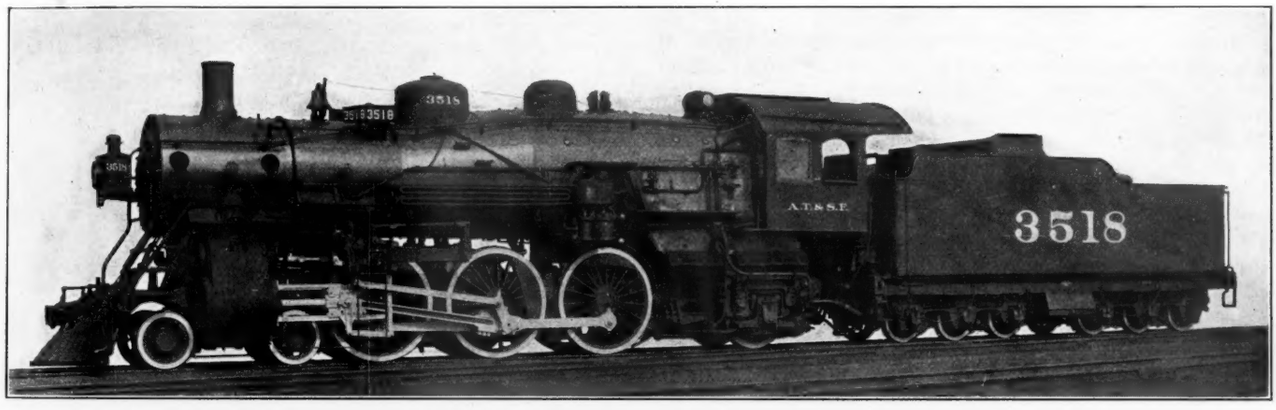
Some roads do a great deal, if not all, the unloading of track and bridge repair material, picking up scrap, etc., by the local, figuring it is cheaper than a work train; but the local crew costs more than other crews and long jobs of unloading demoralize this important service, which is a great factor in increasing the revenue of the road. There are some passenger trains which are operated at a loss so far as the passenger receipts are concerned, but they are run because the business men's clubs in certain towns have guaranteed so much freight business in exchange for the passenger service. Why not go a little further and make the local freight trains soliciting agents? It might pay better than the small army of traveling freight solicitors now going through the country with handsome salaries and unlimited expense accounts. It should be possible to run a local train over the division in 10 or 11 hours and make it a paying proposition, but it cannot be done by starting out of the terminal with the full rating of the engine, say 1,500 to 1,800 tons, probably 60 or 70 cars, involving the possibility of doubling hills, pulling out draw bars, sawing trains at short sidings, etc. Running locals on time would make a difference in the attitude of the patrons along the line, and of the men in charge of the trains, in the overtime account and in various other problems incidental to the irregular local.

BOLIVIAN GOVERNMENT OFFICIALS LOSE RAILWAY PASSES.—A press despatch from Sucre, Bolivia, reports that a ruling has recently been made to the effect that officers of the Bolivian government are no longer entitled to free railway passes. They obtain half rates, however, when traveling on official business.

SANTA FE BALANCED COMPOUND PACIFIC TYPE LOCOMOTIVE

During the past three years, the motive power department of the Santa Fe system, acting in conjunction with the Baldwin Locomotive Works, has developed an interesting series of balanced compound Pacific type locomotives* for express passenger service. This series now includes 115 engines, which have been distributed over different parts of the system. These locomotives are in general alike, but the details have been improved in successive orders.

The Santa Fe has long recognized, not only the advantages to be derived from compounding, such as increased capacity and economy, but also the fact that compound locomotives must be suitable for the service, intelligently handled, and properly maintained. This policy has been persistently carried out, and to it the success of the balanced compounds is largely due. The Pacific type locomotives to which reference has been made embody a cylinder arrangement first introduced in locomotives of the Prairie type which were built for fast freight service in 1906. The inside or high pressure cylinders are elevated and inclined so that their main rods pass above the first driving axle. This arrangement preserves the simplicity of the original Vauclain balanced compound, and at the same time avoids the necessity of using bifurcated inside rods in order to clear the first driving axle.



Latest Development of the Balanced Compound Pacific Type Locomotive on the Santa Fe

There are 35 locomotives in the recent order. Of these, 14 burn oil, 20 bituminous coal, and one Gallup coal, which is a species of lignite. The bituminous coal burners are further divided into two groups, differences being made in the grates to suit different qualities of fuel. Wherever practicable, the details of these engines interchange with corresponding parts of locomotives already in service.

These locomotives are the first balanced compounds built by the Baldwin Locomotive Works to be equipped with Baker valve gear. The parts composing the gear are of vanadium steel, and they are supported in a cradle which is placed outside the leading drivers. The Ragonnet power reverse mechanism is applied. The piston valves are 15 inches in diameter, and one valve controls the distribution to each pair of cylinders. The high pressure lead is ⅛ in. and the low pressure lead ¼ in. Vacuum relief valves are applied, but no by-pass is used. As the high pressure sections of the valves are arranged for inside admission, the steam pipes can be placed outside, delivering steam to the centers of the steam chests.

The frames are open hearth annealed steel castings, and the main sections are 5 in. in width, as compared with 4½ in. for the previous locomotives of this type. The width between frame centers is 44 in. At the main driving pedestals each frame is offset ¾ in., thus increasing the width between centers to 45½ in. This is done to provide more room for the crank axle. The offset in the upper rail is made in two steps to facilitate a more symmetrical arrangement of spring hangers. The crank axle is of the seven piece, built up type, a design which has given better results in service than any other form used on this road. The trailing truck is of the Rushton type, with outside journals.

The boiler is of the extended wagon top type, with a maximum inside diameter of 82⅛ in. The coal burning locomotives are equipped with brick arches and power-operated grate shakers. In the oil burners, the Booth burner is used; it is placed in the front end of the firebox. The back sheet of the inside firebox, in the oil burners, is flanged outward, thus keeping the rivet heads in the water space. A copper calking strip is inserted between the crown and side sheets and the back sheet. In both the coal and oil burning boilers, the mud ring is horizontal and is carried on sliding bearers at each end.

A feature to be noted is the auxiliary dome, which is placed just ahead of the firebox. The shell opening under this dome is of sufficient size to enable a man to enter the boiler for inspection purposes.

The tenders are carried on two Commonwealth steel trucks, each of the six-wheel type. Similar trucks have been successfully used under tenders previously built for this road. Excessive wheel loading is thus avoided, and in the present case, although the tank capacity is 10,000 gal., and each tender approximates 200,000 lb. in total weight, 5½ in. by 10 in. journals can be used, with moderate unit pressures.

The following are the principal dimensions:

General Data

Gage	4 ft. 8½ in.
Service	Passenger
Fuel	Bit. coal
Tractive effort	34,000 lb.
Weight in working order	277,700 lb.
Weight on drivers	165,100 lb.
Weight on leading truck	57,500 lb.
Weight on trailing truck	55,100 lb.
Weight of engine and tender in working order	480,000 lb.
Wheel base, driving	13 ft. 8 in.
Wheel base, total	35 ft. 1 in.
Wheel base, engine and tender	70 ft. 6¼ in.

Cylinders

Kind	Balanced Compound
Diameter and stroke	17½ in. & 29 in. by 28 in.

Valves

Kind	Piston
Diameter	15 in.

Boiler

Style	Wagon top
Working pressure	210 lb.
Outside diameter of first ring	70 in.
Firebox, length and width	109⅝ in. by 76¼ in.
Tubes, number and outside diameter	26—5½ & 199—2¼ in.
Tubes, length	21 ft.
Heating surface, tubes	3,235 sq. ft.
Heating surface, firebox	211 sq. ft.
Heating surface, firebrick tubes	29 sq. ft.
Heating surface, total	3,475 sq. ft.
Superheater heating surface	619 sq. ft.
Grate area	58 sq. ft.

*See *American Engineer*, October, 1912, page 515.

Wheels

Driving, diameter over tires	73 in.
Driving journals, main, diameter and length	11 in. by 10 in.
Driving journals, others, diameter and length	10 in. by 12 in.
Engine truck wheels, diameter	34¼ in.
Engine truck, journals	7 in. by 12 in.
Trailing truck wheels, diameter	50 in.
Trailing truck, journals	8 in. by 14 in.

Tender

Wheels, diameter	34¼ in.
Journals, diameter and length	5½ in. by 10 in.
Water capacity	10,000 gal.
Coal capacity	12 tons

NEW HAVEN TRAIN RULES

The New York, New Haven & Hartford has just put in use a new code of rules for the government of the operating department, the work of a committee, which for several months has been engaged in the revision of the old code. The same book is used on the Central New England, which is controlled by the New Haven.

The Standard Code—the part corresponding to the code issued by the American Railway Association—fills 78 pages, and the rules for block and interlocking signals, air brakes, etc., and the chapters for the different classes of employees fill 250 more. The "general rules" which in the A. R. A. code come at the beginning of the book, are in this code put after the Standard Code and at the beginning of those rules, not uniform on railroads generally, which are addressed to different classes of employees. The rules of the Standard Code are in three series: (a) 1 to 111; (b) 150 to 200; and (c) 201 to 223. The numbers from 150 to 200 are assigned to rules which are to be printed on the time tables. That is to say, they are not in the book, but they have the same effect as though they were.

Rules 250 to 256 are those for transmitting train orders by telephone. The other rules are as follows: Manual Block System 301 to 375; Controlled Manual Block System, including the Electric Train Staff, 401 to 499; Automatic Block system, 501 to 513; Interlocking Signals, 601 to 673; Distant Switch Signals, etc., 680 to 690; Rules for Time Spacing, 693-694; Air Brake Rules, 701 to 790; Steam Heat, 794-797.

Following the "general rules" are the "General Regulations," 801 to 839, and then follow the rules for the different classes, 42 chapters for 42 classes.

RULE NINETY-NINE

The flagging rule in this book may be looked upon as the latest product of the combined wisdom of a committee of officers on this subject, and therefore we quote in full. It will be observed that although the American Railway Association rule is greatly amplified, no distances are mentioned. Including the four supplementary rules, the flagging rule is as follows:

"99. When a train stops or is delayed, under circumstances in which it may be overtaken by a following train, the flagman must go back immediately with stop signals a sufficient distance to insure full protection, and will there place two torpedoes on the rail two rail-lengths apart on the engineman's side. He will remain at this point until recalled.

"If a following train is within sight or hearing before the flagman has reached a point insuring full protection, he must, at once, place two torpedoes on the rail, and at night or in foggy or stormy weather or where the view is obscured he will in addition display a lighted fusee, and continue toward the following train, displaying stop-signals until it is met.

"If recalled before reaching a point insuring full protection and a following train is within sight or hearing, the flagman must, at once, place two torpedoes on the rail, and at night, or in foggy or stormy weather or where the view is obscured, in addition, display a lighted fusee, and continue toward the following train displaying stop signals until it is met. If no train is within sight or hearing he may return, first placing and leaving two torpedoes on the rail, and where the view is obscured or in foggy or stormy weather, he will, in addition, leave a lighted fusee on the track between the rails.

"When recalled after reaching a point insuring full protection if a following train is within sight or hearing the flagman must display stop signals and at night or in stormy weather or where the view is obscured he will in addition display a lighted fusee and remain until the following train arrives. If there is no following train within sight or hearing the flagman may return, leaving the torpedoes as placed, and at night or in foggy or stormy weather or where the view is obscured, he will, in addition, leave a lighted fusee on the track between the rails.

"The front of a train must be protected in the same way when necessary by the head trainman, and when he is not available, by the fireman.

"Should the speed of a train be reduced under circumstances in which it may be overtaken, either day or night, a lighted fusee must be thrown off at intervals to warn following trains.

"Block and interlocking signals will not relieve flagmen from observance of this rule.

"Signals to be used by flagmen:

"By day—Red flag;
torpedoes;
fusees.

"By night—A red light;
a white light;
torpedoes;
fusees.

"99a. When work train crews, trackmen or other employees are performing work requiring flag protection, the flagman will be furnished written instructions which must be shown to the engineman of all trains stopped by him.

"99b. When a train crosses over to, or obstructs a track on which the current of traffic is in the opposite direction, it must, unless otherwise provided, first be protected as prescribed by Rule 99, against trains moving with the current of traffic on that track, except as provided by Rule 672.

"99c. When, on other than a single track, trains are stopped unexpectedly or meet with accidents the nature or extent of which is unknown, flagman must be sent out in both directions at once to protect the movement of trains on all tracks, without waiting to determine what tracks are obstructed.

"99d. Stop signals must be answered promptly by enginemen, and flagmen must repeat signals until they are acknowledged."

MODIFICATIONS OF STANDARD RULES

Following are the numbers of the principal rules, other than the flagging rule, which differ in form or substance from the same rules as they appear in the A. R. A. code: 5, 10a, 11, 15, 17, 19, 21, 21a, 24, 27, 31, 33, 40, 41, 71, 72, 83, 84, 85, second paragraph; 86, 87, 88, 89, 90, 90a, 91, 93, 94, 96, 97, 100, 101, 102, 104, 104a, 104b, 105, 106, 107, 108, 109, 206, 208, 209, 211, second paragraph; 221, 221a, 221b, 221c.

We note some of the principal differences as compared with the A. R. A. standard.

Rule 11 prescribes a yellow fusee as a caution signal. Rule 14 shows 12 combinations of sounds to call in a flagman; one for each direction on each of six main tracks. To enable trainmen to familiarize themselves with these whistle signals a pocket card has been provided, a facsimile of which, slightly reduced in size, is shown herewith. The dashes and circles in the right-hand half of the card are printed in red. The other whistle signals are described on the other side of the card.

Rule 15: Torpedoes never require a stop absolutely. Torpedoes must not be placed near rail joints.

Rule 17 does not require headlights of locomotives to be concealed at any time. Rule 19 provides different arrangements for tail end signals on four-track sections. Marker lamps serve night and day, no tail end flags being used.

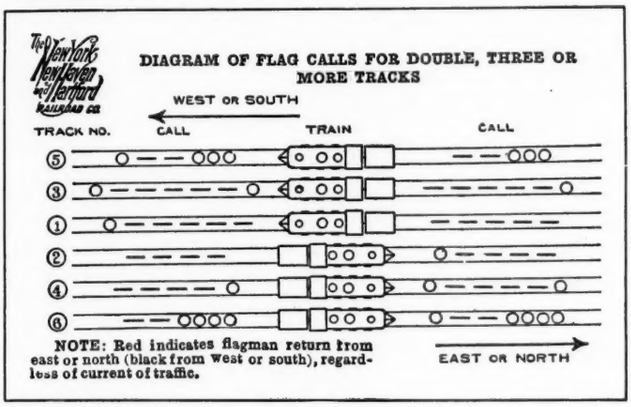
"21a. (Second paragraph)—On double, three or more tracks, light engines, freight trains and work trains will not be run as sections of first class schedules."

Except on single track lines, extra trains do not display white signals in front, but this provision does not apply to trains com-

posed of passenger equipment. Rule 33 requires white signals to be used to signal to pedestrians and teams at crossings.

Rule 40 takes the place of Rule F 271 of the Standard Code, and 41 takes the place of F 272.

Rules 71 and 72 make no reference to right by direction, all trains on single track being required to wait indefinitely at meeting points for opposing trains of the same class. Rule 83 is



amplified to cover this point. Rule 84 provides for giving the start signal by hand or lamp (not by voice); but on certain electric trains the conductor may give the signal by the bellcord.

Rule 85 permits extra trains to pass and run ahead of second class trains.

Rules 86 and 87 provide a time interval of ten minutes. Rule 88 makes the west or southwest train inferior. This and Rule 89 refer only to the matter of taking the side track.

"90. Trains must stop clear of the switch used by the train to be met in going on the siding.

"At meeting points, if the train which is to hold the main track arrives first, the switch to the siding must be thrown, if practicable, for the opposing train.

"Trains and engines must run with caution when entering or moving through sidings or side tracks, expecting to find them occupied; and where sidings are used by trains in both directions, trains must move through them expecting to meet opposing trains on the siding."

Rule 90a requires the conductor on approaching a meeting point to give the stop signal.

Rule 91 provides a time interval of 10 minutes. Rule 93 says that yard limits will be designated on the time table and also will be indicated by yard limit signs. Within yard limits only first class trains need be flagged. Trains carrying passengers are not relieved from the observance of Rule 99 within yard limits.

Rule 94 is radically different from that of the Standard Code as will be seen—

"94. If an accident occurs to a train between stations so that the assistance of tool train or engine is required, a message, signed by the conductor and engineman, must be sent from the nearest telegraph office or telephone to the superintendent, giving the location of the train as nearly as possible and stating that the train or engine will not be moved and will be protected in both directions until the required assistance arrives."

Rule 96 provides that on single track signals shall not be displayed for a following section to a point that is not a register station.

Rule 101 is elaborated to provide additional safeguards for a four-track line. Rule 104 consists of eight paragraphs giving detailed instructions for the care of switches. Rules 104a and 104b give additional details for such operations in yards.

Rule 105 takes the place of Standard Rule D153 and provides for passing passenger trains at stations where there are no fences between the tracks. Rule 106 requires care in approaching passenger cars which are occupied. When making couplings a stop must be made, not more than 30 ft. and not less than 10 ft. from the standing car.

Rule 107, consisting of five paragraphs, prescribes precautions to be taken when trains are run against the current of traffic. The speed must never be more than 20 miles an hour. The last rule of this chapter, which in the Standard Code is No. 108, is here No. 111; in cases of doubt, take the safe course, etc.

Rule 209 requires that where a train order has to be written a second time it must be repeated a second time.

Rule 221 makes the normal position of the train order signal "proceed."

Rule 221a provides that where there is no train order signal and no block signal used for that purpose, a double-staff red flag shall be used to stop trains for orders, and in storm or fog torpedoes must also be used, being placed 500 feet back from the signal.

RULES OF OTHER EASTERN ROADS

In connection with the revision of the New Haven book, a careful comparison was made with the rules of the Boston & Albany, the Delaware, Lackawanna & Western, the Erie, the Lehigh Valley, the New York Central and the Pennsylvania. We have been favored with a copy of the memorandum made in this comparison, from which we give herewith some of the more important points wherein the codes of the different roads differ from that of the American Railway Association.

Rule 16. The Boston & Albany omits section *a*, which provides that when a train is standing, two blasts of the air signal shall mean "start."

The use of green flags as markers at the rear end of trains has been discontinued by the Boston & Albany, the Lackawanna, the New York Central and the Pennsylvania. The B. & A. and the N. Y. C. have substituted yellow lenses for the green in the marker lamps.

Rule 21. The Lackawanna, the Lehigh Valley and the Pennsylvania omit the use of white flags on extras, as does the New Haven.

Rule 22. The B. & A., the Erie, the Lehigh Valley and the N. Y. C. require signals displayed on both engines. The New Haven follows the Standard Code, displaying signals on only the leading engine.

Rule 93. The Lehigh Valley limits the speed of first class trains within yard limits.

The Lackawanna uses only the first paragraph of Rule 94.

Rule 99. All of the roads named, except the Pennsylvania, have various additions to this rule; too various and too numerous to be shown here.

Rule 101. The B. & A., the Erie, the Lackawanna and the Pennsylvania require the front portion to return under protection.

Rule 206. In the use of words and figures in train orders, the practice of these roads is varied; no two are alike. The New Haven requires time to be stated in words and figures.

Rule 208. All of the roads, the New Haven included, require train orders to be sent to the operator at the meeting or waiting point "when practicable." None of them makes this requirement absolute. Rule 210. The Pennsylvania rule requires enginemen to sign orders, as does the New Haven.

Rule 211. On the New Haven, blank form 19 must be used for train orders of Form F; nor to restrict the right or schedule of a train; but on double track it may be used for Forms B and E. The Boston & Maine, the Erie, the Lackawanna and the Lehigh Valley prohibit the use of Form 19 to restrict the superiority of a train.

SOUTH AFRICAN RAILWAY STRIKE.—A bill introduced in the house of assembly in Cape Town, South Africa, making special provision for the railway men who remained faithful during the recent strike, and also for dealing with the railway men who struck, grants the loyal men four days' special leave on full pay, and the railway men who served with the defense force three extra days, also extra pay for specially meritorious service. The strikers who returned to work in accordance with the notices of January 16 and 22 will be fined one and a half day's pay for every day out.

LEHIGH VALLEY HIGHWAY CROSSING SIGNALS

The use on the Lehigh Valley of highway crossing signals which give both an audible and a visual indication, heretofore noted in the *Railway Age Gazette*, has been rapidly extended, and the company now has 47 grade crossings thus protected. These crossings are scattered throughout the lines of the company in New Jersey, Pennsylvania and New York. The crossing at Treichler, Pa., is shown in the accompanying engraving. It will be noticed that the disk of the signal is not set parallel to the line of the railroad, the highway being laid on a curve and requiring that the signal shall be seen on a line at an acute angle with the railway. The back side of the signal for the approach on the other side of the railway will be seen close to the end of the station building. The sign shown on the farther side of the tracks, at the right of the telegraph pole, bears the legend "Railroad Crossing; Stop, Look and Listen."

The enclosed disk signals used for the purpose here indicated are those heretofore in use as automatic block signals. Three-position, upper quadrant semaphores have been adopted as standard for the block signals, releasing a large

Audible and Two-Indication Visual Signal for Highway Crossing

number of disks for this new use. The company proposes to install these signals as rapidly as possible at all road crossings on the main line, except those at which there are gates.

The signal shown in the illustration stands at "Danger," a red disk for the day-light indication. A red light shows at night at the smaller opening in the upper part of the "banjo." When no train is approaching the disk appears white. The sound is given by the usual large gong. The shadow which appears at the right of the upper opening in the signal case is caused by a shield fixed to the case to prevent the red light from being seen by enginemen.

In these crossing signals, as well as in all automatic block signals now being installed, acetylene gas is being used. This illuminant was first employed by the Lehigh Valley for this purpose in August, 1910, on the Perth Amboy branch, and since then it has been installed in 370 signals.

The acetylene gas has proved much more reliable than kerosene. It is so much more reliable, in fact, that on the three-position upper-quadrant signals the additional lamp for a "marker" is not used. In the past four years only two acetylene lights have gone out. One of these failures was due to the gas burner enlarging and using up the supply, and the other was caused by loose scale falling upon and stopping the valve.

The cost of acetylene is also less than kerosene. To light one kerosene lamp with oil has cost 2.3613 cents per 24 hours, or 4.7226 cents for two lamps on a signal. To light a three-position upper-quadrant signal with acetylene gas costs only 4.3822 cents for 24 hours. The cost of the gas itself is only 2.5 cents, but the interest on the equipment, which amounts to 1.8822 cents for twenty-four hours on the investment of $114.50, makes up the difference. If oil were used in a three-position upper-quadrant signal, the company would deem it necessary to have a second lamp, in accordance with the Railway Signal Association standard, as kerosene is less reliable; and the cost would then be greater than for the single acetylene light.

THE DETROIT TERMINAL RAILROAD

With the recent completion of the last section of its belt line around the city of Detroit, the Detroit Terminal is in a position to become an increasingly important factor in the industrial development of that city. The unusually rapid growth in the number and size of the industrial plants located along the main lines of the railways entering the city has caused serious congestion in practically all of the area within the city limits suitable for such development. A belt line within the limits has been proposed frequently in order to provide additional trackage to develop new territory and the Michigan Central built a section of such a line from its Bay City division south to the river at a distance of about two miles from the heart of the city. Such a line could offer only temporary relief, however, and many railway and business men who had given the subject careful consideration were of the opinion that the only permanent relief was to be secured by building a complete outer belt line outside of the city limits.

The first step toward the realization of this plan was taken in 1905, when a company was organized to be financed by local capital for the purpose of building a line from the Detroit river north to a connection with the Michigan Central and the Grand Trunk at a distance of about four miles from the city hall. This section of what was later to be the Detroit Terminal, was built in 1906 and at present is serving a large number of important manufacturing plants. The original company was later acquired jointly by the Michigan Central, the Grand Trunk and the Lake Shore, and the new belt line extended in sections until the company now operates 18 miles of main line extending from the river on the east around the north side of the city to the Michigan Central main line on the west in addition to 18 miles of industrial side tracks. The property, including equipment, represents an investment of about $1,500,000.

The line is single track with the exception of the section south of the Michigan Central main line. Provision has been made for double tracking the entire line and it is expected that some second track will be laid in the spring. The principal yard is located at North Detroit, where it is planned to provide for an ultimate capacity of about 3,000 cars. The present equipment consists of six 170,000-lb. superheater locomotives.

The terminal has been aptly characterized as an automobile road on account of the large number of automobile and automobile accessory companies which it serves. In the first nine months of the past year there originated on the belt line 29,000 car loads of finished automobiles, an average of over 100 car loads per day. The total movement on the line averages about 75,000 loaded cars in and out per year. The company has not adopted the policy of owning real estate suitable for industrial development and offering it on lease to prospective manufacturers, but stands ready to build an industrial siding into any new plant located within reach of its lines.

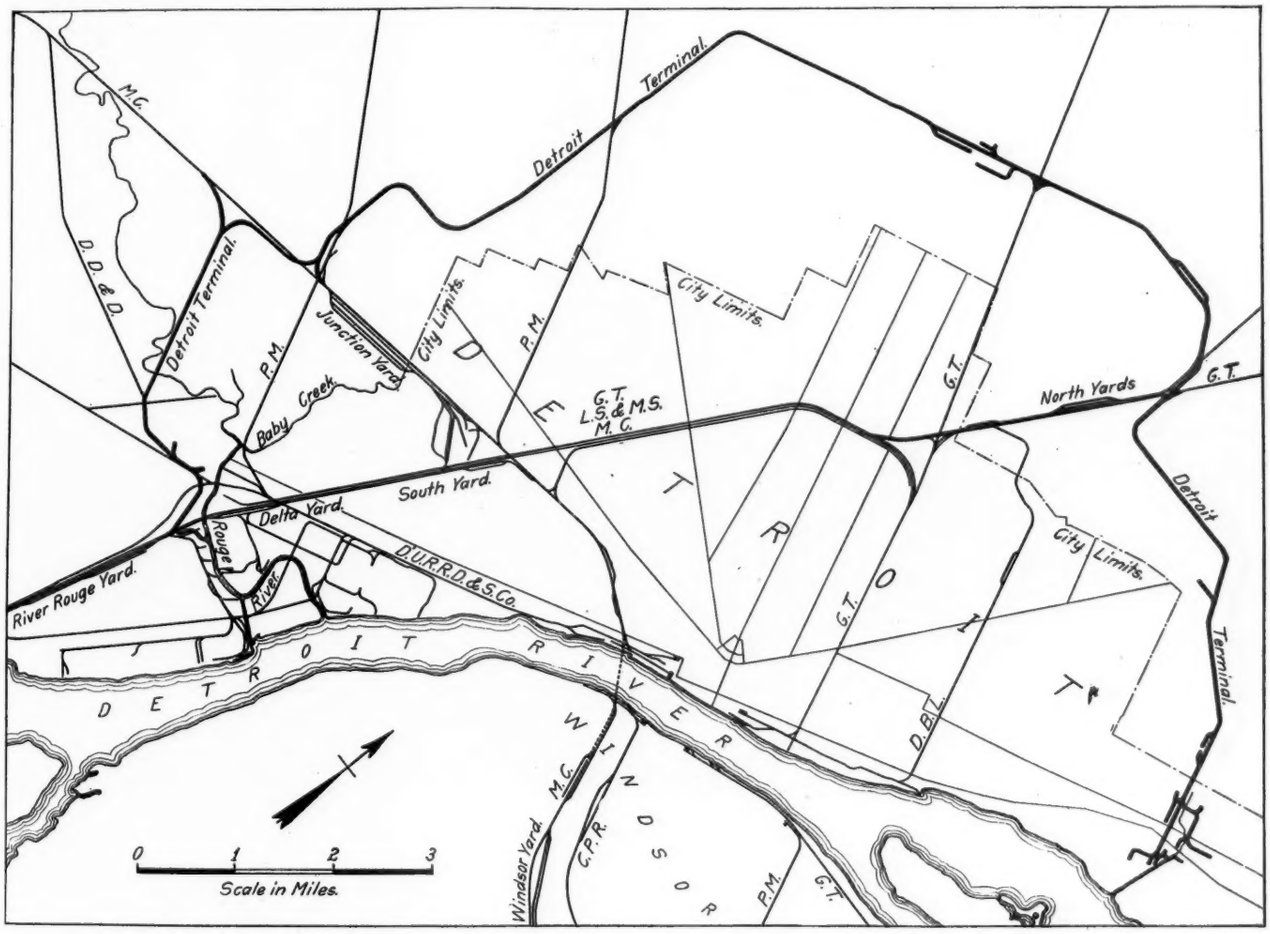
There are about 50 important industries served by the line

at present, including the Chalmers Motor Co., the R. C. H. Corporation, the Hudson Motor Co., the Continental Motor Co., the Lozier Motor Co., the Ford Motor Co., all of which produce automobiles, and the Metal Products Co., the Welded Steel Barrel Co., the Anderson Forge & Machine Co., the Armstrong Tanning Co., the Glass Enamel Package Co., and the Detroit Cast Stone Block Co., producing miscellaneous products. The line also serves the Edison Illuminating Co., and about 50 other plants which do not produce business but are large receivers of coal, building supplies, etc.

Every industry along the line is switched once a day and oftener if the amount of business warrants. In most cases an engine pulls the loaded cars from a number of industries in one drag to the classification yard at North Detroit and the distribution to the industries is made in a similar manner. For some of the larger plants, as the Ford Motor Co., or the Edison Illuminating Co., solid train load deliveries are made direct from the yard. The Ford company is one of the largest producers along the belt line, the maximum day's business at that plant being 176 car loads in 24 hours, representing 1,008 complete automobiles. This plant is served by six tracks with a capacity of 16 to 18 cars each and it is sometimes necessary to handle as high as 120 cars at this plant in one switch. In addition to the outbound loads, the Ford company also receives a large amount of material, running as high as 100 car loads per day.

While the industrial development along the belt line has barely begun and a comparatively small amount of the total business of the city is originated by the Detroit Terminal at present, the line serves other important functions in improving the freight terminal situation in the city. Although its ownership is vested in three roads, it has physical connection with the Pere Marquette, the Wabash, and the Detroit, Toledo & Ironton in addition to the owning companies. By handling the transfer of through business over the Detroit Terminal the classification yards on the other roads are very much relieved and the handling of local business is very much facilitated. The line also serves, of course, to collect and deliver business to the main lines and to receive and distribute incoming business to the industries which it serves.

The Detroit Terminal is operated by an organization independent of the owning roads, W. D. Trump being manager of the property.



Map of Detroit and Vicinity Showing Detroit Terminal Line and its Relation to Other Freight Lines

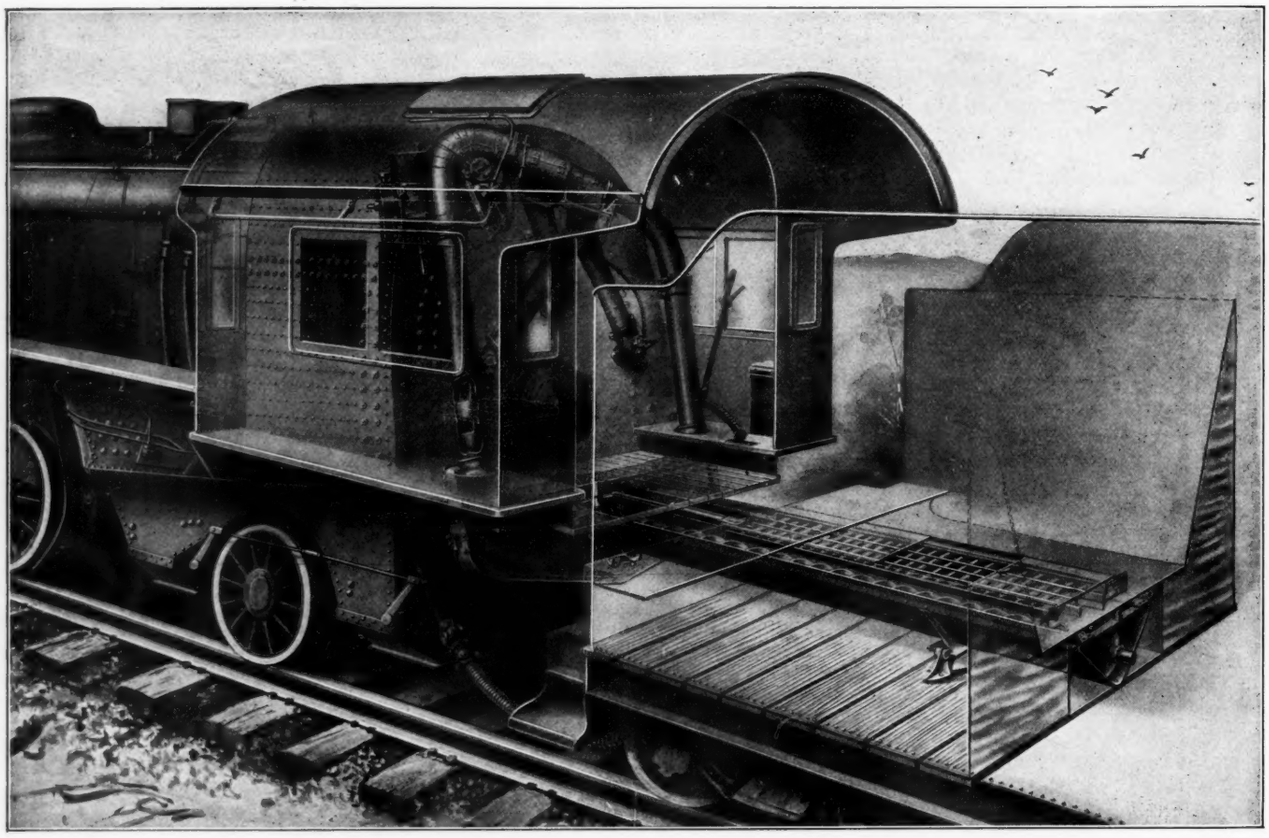
STREET TYPE C LOCOMOTIVE STOKER

The Street locomotive stoker, as it is now being manufactured, is the result of seven years' development work, during which period it has been built in three different types, designated as A, B and C. The type A stoker was the first experimental design, for which run-of-mine coal was placed on the tank, where a crusher was provided for reducing it to the proper size.

The type B stoker is the same as type A, with the exception that the crusher is omitted, and a screen is provided in the floor of the tank for admitting prepared coal to a screw conveyor which carries it to the locomotive and delivers it to the stoker. This type of machine has been fitted to 375 locomotives, and they are all now in regular service. The operation of this machine has been eminently satisfactory, but it was found that improvement could be made in a num-

ber of its features, and the type C machine has therefore been brought out.

The type C machine consists essentially of a screw conveyor for conveying prepared coal from the tender to the locomotive, an elevator for raising it to a point above the fire door, a regulating system for regulating its delivery to the firebox, and a distributing system for spreading it over the grate. It differs from the type B machine in the steam engine which runs it and in the sprocket wheel casing. The connection between the engine and the elevator on the type B machine is fixed, while on the type C it is through a friction clutch which furnishes a means for stopping the elevator instantly and allowing the engine to continue to run. The type B machine has a gear box on the elevator for throwing the screw conveyor in and out of gear and for changing the speed at which it runs in relation to the elevator. This is omitted on the type C machine and this connection is fixed.



Street Type C Stoker Applied to a Locomotive

The friction clutch is one of the most important improvements in the new machine, as it furnishes a means for instantly stopping the flow of coal to the firebox and leaving the elevator buckets filled with coal ready to begin feeding again the moment the clutch is thrown in. This gives an absolute control of the time at which coal is fed to the fire and it is claimed makes smokeless firing very easy. The speed changing device is another important improvement, as it gives the fireman control of the quantity of coal fed to the fire.

The speed control lever is on the face of the engine, at a point where it can be conveniently reached by the fireman, and has seven notches. When this lever is in notch No. 1, the engine will run at a constant speed of 400 r. p. m. regardless of the load on the elevator, and also regardless of variations in the steam pressure on the boiler, that is, so long as it does not fall below 100 lb. When the lever is in notch No. 7, the engine runs at a constant speed of 600 r. p. m. regardless of the load. Each of the other five notches gives a change of speed of about 33 r. p. m. The elevator, regulating system and screw conveyor are connected direct to the engine, so that any change in its speed will result in a corresponding change in the speed of the entire machine; consequently, by increasing the speed of the engine, an increase is made in the speed of the entire stoking apparatus, resulting in a corresponding relative increase in the amount of coal delivered to the firebox. When the elevator is run with all of the buckets filled and the engine making 600 r. p. m., the stoker will deliver coal to the firebox at the rate of approximately 12,000 lb. or six tons per hour. On locomotives which do not burn a maximum of six tons per hour the elevator buckets are filled only to a point which will meet the maximum requirements. By dropping the speed lever to notch No. 1, the speed of the engine can be reduced one-third and the coal supply reduced correspondingly. By placing the speed lever in any of the other five notches, a corresponding change can be made in the supply of coal delivered to the firebox. This gives a very flexible arrangement, one which can be adjusted quickly and which will cover the coal requirements for any range of service likely to be demanded by the locomotive. One of the great advantages of this design is the fact that a fireman can go from one locomotive to another and duplicate results.

The Street locomotive stoker is manufactured by the Locomotive Stoker Company, Schenectady, N. Y.

RAILWAY CONSTRUCTION IN INDIA.—The prospectus of the Bankura-Damoodar River Railway has been issued for a 2 ft. 6 in. railway from Bankura to Raina, a distance of about 60 miles, with a capital of $1,165,000, of which $1,135,000 is being issued at present. Interest on paid-up capital at 4 per cent. will be paid out of capital during construction, and after that period expires the secretary of state will guarantee interest.

HALL-SCOTT MOTOR CARS

The first motor car manufactured by the Hall-Scott Motor Car Company, San Francisco, Cal., was placed in service in the early part of the year 1909 on the Yreka Railroad, a line eight miles long extending between Yreka and Montague, in the extreme northern portion of California. This road was previously operated by a wood-burning steam locomotive, the wood costing $4.50 per cord. The motor car replaced this equipment in the passenger service only. For the 13 months ending June 30, 1910, the Yreka Railroad reported a motor car mileage of 7,037 miles, with a total cost of oil and gasolene of $558.27, giving a cost of fuel and oil per motor car mile of 8 cents. The maximum grade on this road is 2.3 per cent., and the sharpest curve is 12 deg. 30 min., which also is located on this grade.

We published in the issue of May 2, 1913, page 1000, service results obtained by the use of the type M-4, 100 h. p. motor car used on the Holton Interurban Railroad at Redlands, Cal. Since that time more operating information has been obtained on this road, as follows:

Item	December to November, 1910-1911, inclusive	December to November, 1911-1912, inclusive	May to October, 1913, inclusive	Dec. to Nov., 1912-1913, inclusive. Motor Car Type M-6, 150 h. p.
Number miles traveled per month	2,013	1,890	2,123	1,803
Number miles traveled per day	66.37	63	71	60
Gallons gasoline used per mile	0.2765	0.265	0.30	0.36
Gallons gas engine oil per mile	0.0185	0.012	0.013	0.015
Machine shop bill per month	$54.03	$41.37	$21.31	$27.00
Cost of repairs per mile	$0.026	$0.0218	$0.01	$0.016
Total operating cost per mile	$0.096	$0.088	$0.07	$0.094

In the above table the cost per mile for operators was not included.

The Hall-Scott motor cars are now being equipped with intake manifold arranged to burn distillate, which may be obtained at a much lower price than gasolene. Where the price of gasolene is from 20 to 22 cents, the distillate may be purchased for from 7 to 8 cents per gallon. With this fuel the cost of operation will be very materially reduced. With these intake manifolds it is possible to use distillate ranging from 32 deg. to 62 deg. Baume.

The motor cars are built complete within the works of the Hall-Scott Motor Car Company at West Berkeley, Cal. The car has a steel body consisting of an underframe made up of two 7 in. channel outside sills and two 7 in. I-beams for center sills. The engine is supported on these I-beams, as are the couplers at either end. Cross members of 4 in. channels are riveted to the sub-frame sills with steel knee fastenings. The for aeroplanes. The engines are provided with two systems of ignition, the Bosch high tension magneto and the Atwater-Kent unisparker, with battery connection. The carburetor is of their own design and manufacture. The engine cylinders are provided with removal heads, the valves being placed directly in the heads. The absence of valve cages permits equal compression in all cylinders. The engine is lubricated by a positive driven gear pump.

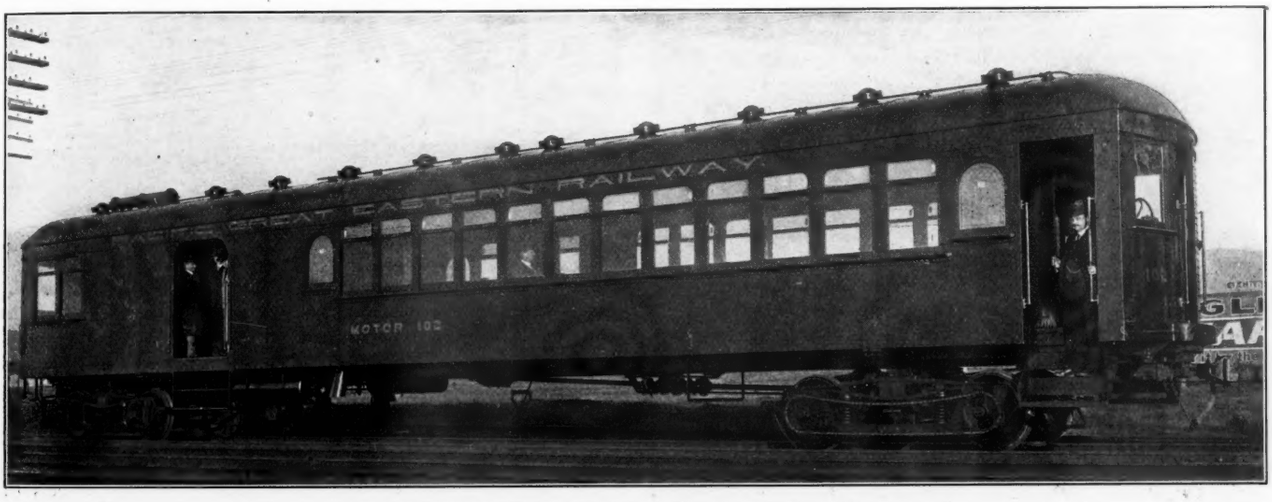


Fig. 1. Hall-Scott Motor Car on the Pacific Great Eastern

The transmission is a direct drive from the gasolene engine located in the forward part of the car to the driving wheels, which are in the rear truck. The drive is very similar to what is used in automobile construction. The driving steel shaft is made in two sections, and is placed below the floor line, being suspended between the two steel 7 in. I-beams. The first section of the shaft is held in position in babbitted journal boxes bolted to steel plates, which are riveted to the sub-frame members. The second section is provided with universal and split joints which take care of the truck movement. The clutch is placed directly within the engine flywheel, and is of a design to permit starting the car without vibration.

The transmission gears which are shown in the illustration consist of a series of spur and beveled gears cut from solid forgings of nickel steel, or from high carbon steel castings. They are heat treated and case hardened. All the gears run in an oil bath and are enclosed in an oil tight and dust proof, three-piece steel, transmission case. This case is suspended on the front axle of the rear truck in exactly the same manner as found in electric motor axle suspension. The journal boxes are cast integral with the transmission case, and are provided with removable journal brasses. The third point of suspension is carried by a steel nose support resting on flat steel members of the trucks. This transmission provides four speed changes in either

The trucks are of the Hall-Scott manufacture, and are of the M. C. B. type, having spiral and elliptical springs, swing bolsters and inside hung brakes. They have a 7 ft. wheel base. The axles are 5 in. in diameter and the journals 4¼ in. x 8 in. The wheels are 33 in. chilled cast iron. Power plants of 100, 150 or 250 h. p. are provided to suit the requirements. The standard type, M-6 style, has 6 cylinders with 150 h. p. engines, the cylinders measuring 8 in. x 10 in. The motors are the four-cycle type, being water cooled, and are of the design and manufacture of the Hall-Scott Company. This company has made a specialty of gas engine work and has built many gas engines

end sills are 7 in. channels. The body bolsters are of flat steel, being made up of two members, 1 in. by 8 in., having cast steel fillers. The side posts and carlines are 3 in. channels, riveted to the outside sills with steel knee fastenings. The outside sheathing and roof plates are No. 12 sheet steel. The flooring is double in thickness. The interior finish in the main passenger compartment is West Coast mahogany.

direction without reversal of the engine. The gear changes are made through two levers located in the engine room, Fig. 2 showing the arrangement of these levers.

Fig. 3 shows the top set of gears removed. It will be noted that there are three spur gears and one combination spur and bevel gear, the bevel gear engaging directly with either of the other large bevel gears which are fixed to the driving axle.

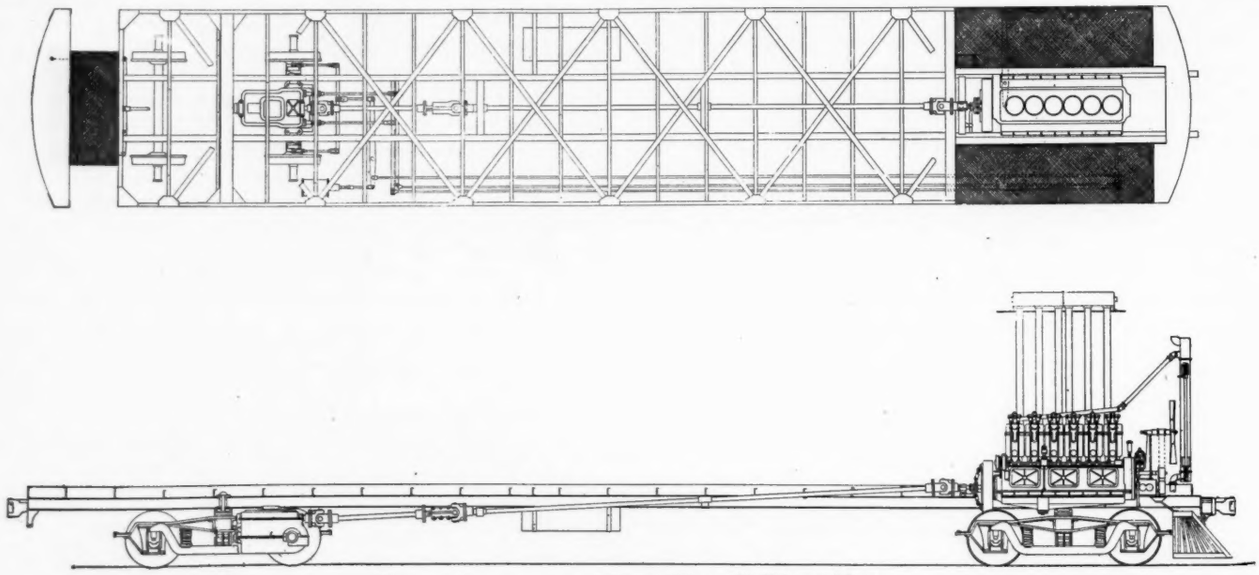


Fig. 2—Arrangement of Power Plant, Hall-Scott Motor

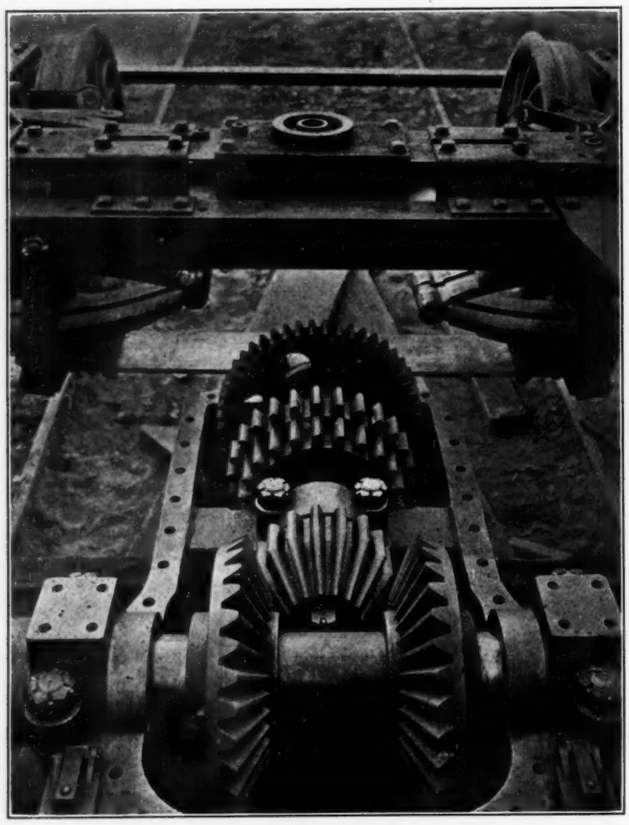


Fig. 3. Transmission Gear with Top Set of Gears Removed

The gears in the illustration are shown in their neutral position. To bring them in contact with the large bevel gears the whole gear case is shifted by means of an air-operated lever either to the right or to the left, according to the direction in which it is desired to move the car.

Fig. 4 shows the top set of gears in place. There are two sets of these gears mounted on a splined shaft, and driven directly from the engine driving shaft. These gears are shifted according to the speed desired by means of levers operated from the cab or front end of the car. Fig. 4 also shows the cams used to move the gear case from one side or the other, bringing the small beveled pinion in mesh with either of the large gears fixed on the driving axle. By pulling the whole gear case forward it will be constrained to move in one direction, and by pushing it backward it will be constrained to move in the other.

The use of chains between the forward and rear wheels of the rear trucks is sometimes adopted to provide a greater amount of adhesion between the wheels and the rails when hauling freight cars or trailers. The type M-4: 100 h. p. motor car is capable of handling 150 tons in trailer cars, on level track, and the type M-6: 150 h. p. motor car will handle from 200 to 250 tons of trailer cars on level track. The Hall-Scott Motor Car Company have under construction a more powerful motor car, which they rate at 250 h. p. This car is expected to handle 400 tons in trailer cars on level track, in yard switching at slow speed, and a 25 to 30-ton passenger trailer coach, over long continuous grade of 3 per cent. at a speed of from 18 to 22 m. p. h.

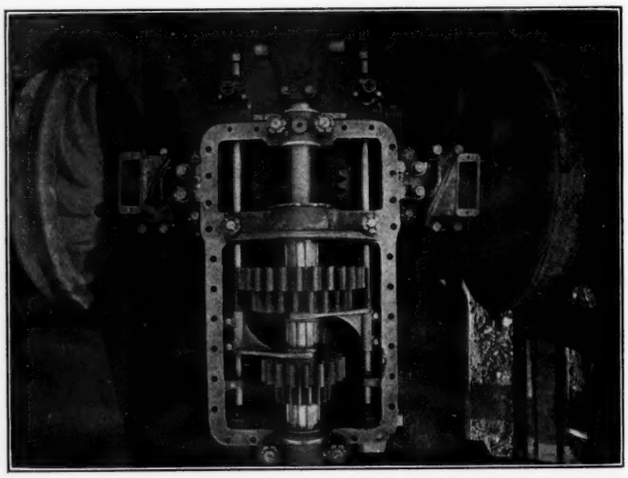


Fig. 4. Top Set of Gears in Place

Maintenance of Way Section

The Cost of Grade Separation

The figures showing the cost of the separation of grades on a new line over and above the cost of construction on the basis of allowing grade crossings with highways and streets is given on another page for a line through a thickly settled portion of New England. While, as a matter of public policy, it is undoubtedly advisable to separate grades with highways of heavy traffic, and while, as an engineering problem, it is economical to separate all grades at the time of construction which it may reasonably be expected will have to be separated within a few years, one result of such requirements will be to render impracticable the construction of many lines which would otherwise be built. The added cost of such work should be considered in making even preliminary estimates for the construction of any proposed line.

Refinements in Trestle Construction

The money which may be expended economically in construction work to avoid delays to traffic is a purely relative matter, depending on the character and density of the traffic. In the May Maintenance of Way Section we described the type of trestles built by the Lake Shore on their high speed main lines, and attention was called to the fact that these trestles differed from those found on lines of less dense traffic in the smaller details of their construction and in the strengthening of the various connections rather than in the essential elements of design. The traffic conditions of the Lake Shore may be considered typical of those on the lines of the densest traffic in this country, and on such lines it is necessary to take many precautions to eliminate interference with trains which would not be justified on lines of lighter traffic. While the measures used on these lines would not be justified on the average western prairie road, at present, they indicate a standard which most roads must prepare to adopt eventually.

The Administration of Discipline

One of the most difficult problems encountered in the operating department is that of administering discipline. Similar attention has not, however, been given this important subject in the maintenance of way department, largely because of the ample supply of capable foremen until recent years, and more particularly because of the absence of any organization among the employees. It is becoming more generally realized among maintenance men that the suspension or discharge of any employee in a responsible position, such as that of foreman, disorganizes the entire gang for a time and in the end is probably more expensive to the company than to the man himself. The discussion by Mr. Bowser in another column is, therefore, timely and valuable. It is certain that the frequency with which employees are discharged on some roads is injurious to the welfare of these roads and that a careful study of the entire subject of the maintenance of discipline through discharge, suspension, reprimand, demerits and other measures, will be instructive. It is generally known that a man is frequently a better and more careful man after the results of the infraction of the rules have been brought forcibly to his attention by some slight accident and that he will be likely to see that he does not fail in this respect again. Under such conditions the company loses by the discharge of the man. A sense of security of position on the part of the men and a knowledge that they will be given an opportunity to be heard in their defense at any time is also a strong aid in the retention of employees.

Remedying Deferred Maintenance

The large surplus of labor bears evidence of the fact that the amount of maintenance work under way at the present time is smaller than in any recent year at this season. This condition is not universally true, for some roads, especially in the South, are making liberal expenditures, but, taking the country as a whole, the expenditures are considerably below normal. Whether the new fiscal year will materially change this condition and permit heavy expenditures to be made is problematical at this time, although favorable indications are seen in several directions. Undoubtedly the most potent influences will be a favorable decision in the eastern rate advance case and large crops, creating a heavy traffic movement. However, deferred maintenance cannot be recovered in a day or a month, and it will be impossible to make up all the time lost this spring by greater expenditures before winter.

Surprise Checking in Scrap Collection

In the Maintenance of Way Section for April we described the operation of a scrap train on one division of a western road as a result of which 147 cars of scrap were collected and turned over to the store department. In the Maintenance of Way Section for May we published a letter from George G. Yeomans, in which he stated that in matters of this kind prevention is much better than cure, meaning by this that the collection of scrap should be continuous and thorough rather than spasmodic. There is much merit in this suggestion. If every employee gave this subject all the attention it deserves all the time there would be no need for special campaigns. But the same might be said about enginemen running by signals. If every engineman obeyed the rules at all times "surprise checking" would not be necessary. However, no one considers "surprise checking" as a reflection on a railway management, but rather it is regarded as an earnest effort to improve conditions. Much the same thing may be said of "surprise checking" in the collection of scrap, such as that recently done on the road referred to. Mr. Yeomans is undoubtedly correct in emphasizing the importance of systematic scrap collections, but as a practical matter, may not the best results be secured by a combination of this continual supervision with occasional "surprise checking"?

Developments in Grading Equipment

An interesting illustration of the rapid development of means for the grading of railway roadbeds was afforded in the construction last summer of a second track on a western road which involved considerable realinement work. At several places close to the operated main tracks projecting points were removed by "station men" with shovels and wheelbarrows. At other places a number of team outfits were working with slip and wheel graders. Within the same limits there were also modern 85-ton steam shovels, while two modern suction dredges were building embankments across the bays of the river. This variety of methods emphasized the fact that the most desirable and economical method of constructing a roadbed varies with the local conditions. On the construction of the Oregon Trunk Railway four years ago over 8,500,000 yd. of excavation, 84

per cent. of which was rock, was removed by men without the use of power machinery, owing to the difficulty of bringing heavy equipment into the work. Most new work, however, is characterized by the extensive use of modern equipment. The latest addition to this class of machinery is the drag line excavator which is able to compete successfully with other methods on many classes of work, as shown in another column. While these machines have been employed mainly by contractors up to the present time, they are applicable to much railroad work and have been used very largely by contractors in constructing new lines or additional tracks with resulting economy to the railroads as well as to the contractors. One such machine has moved 4,000 yd. of earth daily for several months at a time during the past year at a very low unit cost, because of the small force required. In planning a project of any size today the engineer generally has the opportunity to study the relative economies of doing the work by several methods and the opportunity for intelligent selection of equipment is continually widening.

UNIT VALUES IN MAINTENANCE WORK

IN any study of economical maintenance work the first thing which must be determined is a unit of measure. It is impossible to ascertain the relative efficiency of a number of men or groups of men unless there exists a standard with which their outputs of work may be compared. In making a study of any organization the first thing an efficiency expert does is to establish such a unit of measure.

Because of the varied nature of maintenance work, the multitude of problems which must be handled and the difficulty of establishing equitable units, this subject has been given very little attention in this branch of railroad operation. However, this is not conclusive evidence that such units cannot be selected. Indeed, several roads are now making distinct progress along this line and by the intelligent selection of units are greatly reducing the number of kinds of work the efficiency of the performance of which it is considered cannot be pretty accurately measured.

One of the roads which are giving this subject careful attention is the Pittsburgh & Lake Erie, where the routine track maintenance problems are equated on the basis of one mile of main track as a unit and forces are allotted accordingly. Similar measures have also been worked out on other New York Central lines. The most elaborate method developed to date in this country is that employed on the Philadelphia division of the Baltimore & Ohio, where each detail of track work has been assigned a unit value based on careful time studies. By this means it has not only been possible to distribute the forces more satisfactorily, but the output of the gangs has been materially increased, and by the establishment of a bonus system the men as well as the company have received benefits.

Unless one knows the relative influence of the number of switches, the amount of yard and side tracks, the number of trains and their character, the gradients and curvature, and other fundamental characteristics, it is difficult to see how he can apportion his forces between divisions or sections upon any accurate basis. With the system generally employed today the foreman who is best able to present his case will probably have the most men and of course they may or may not be distributed fairly over the division. As a result there is not only a waste caused by the unequal distribution of forces, but, realizing that they are not upon an equal basis, the foremen have not the incentive to exert their best efforts.

The value of proper units for maintenance work can be determined by carefully ascertaining the relative amounts of time required by the different gangs on each class of work. If intelligently compiled such records need not be voluminous or elaborate to make the information that they give exceedingly valuable. No more favorable time for the collection of such data could be selected than now, when the need for economies is pressing. Such records should extend over at least one year, and should begin and end, preferably, with the fiscal year. At the present time, when a minimum of heavy maintenance work is under way, the supervising officers could give more time to the proper collection of such data, which could be made more accurate than ordinarily, because it would be less influenced than usual by addition and betterment charges. For these reasons it would seem that such studies could be very profitably undertaken now.

REDUCTION OF SURPLUS MATERIAL

ONE way in which important economies have been effected within recent years has been in the reduction of the amount of material carried in stock. A number of roads have conducted campaigns varied in their nature and method of attack, but having the same object, and have accomplished excellent results. Much more work of this kind remains to be done. The principal difficulty in the solution of the problem arises from the division of responsibility for the accumulation of either unused or scrap material between the store department, commonly charged with its handling and accounting, and the department using the material. On most roads the store department ships the material required by the maintenance of way department upon requisitions. Occasionally a shipment is delayed for some reason, with the result that the foreman is disposed to retain surplus material to protect himself against similar delays in the future. When this is done all over a system the amount of surplus material accumulated becomes large.

The accumulation of surplus stock may also be occasioned by allowing material to remain in the storehouse until standards are changed and it becomes obsolete. Frequent checking of the material on hand by representatives of the interested departments is one means to prevent this condition. To make the department using the material responsible for the stock retained some roads have turned the storerooms for maintenance of way material over to the maintenance department. However, this plan also has its disadvantages, as is pointed out by "Storekeeper" in another column. There is a limit to the amount of detail which one man can handle properly, and naturally he concentrates his attention upon that part of his work upon which his tenure of position depends, with the result that the supervision of the amount of materials kept in stock is first to be neglected.

The prompt collection of scrap material, the reclamation of that suitable for further use, either immediately or with slight repairs, and the sale of the remainder, present a problem similar to that of the proper distribution of new material. The responsibility for the accumulation of this scrap material along the right of way rests primarily with the maintenance of way department and indirectly with the store department. In these and other instances continued and close supervision by all concerned is the only complete remedy.

While, as stated above, the maintenance of way and store departments are jointly responsible for keeping the proper stock of materials on most roads, the maintenance of way department is so directly interested in this subject and can assist to such a large extent in effecting important economies, that we desire to present this subject for general discussion in our columns from the standpoint of the maintenance of way department. We, therefore, announce a contest on The Proper Distribution of New and the Collection of Scrap Material, to cover approved methods of ordering and distributing material to insure a sufficient but not a surplus stock, and delivery on the work at the proper time, means for the elimination of obsolete material, and measures for the prompt collection, reclamation and disposal of scrap. We will be glad to receive general discussions of this subject, but special emphasis will be laid on descriptions of methods actually used, with statements of the economies effected. Prizes of $25 and $15, respectively, will be paid for the two best papers received, while we will pay our space rates for all other material accepted and published. All contributions should be sent to the Engineering Editor of the *Railway Age Gazette,* 608 South Dearborn street, Chicago, to be received not later than July 25.

Letters to the Editor

REDUCING THE STOCK OF SURPLUS BRIDGE MATERIAL

NEW YORK, May 26, 1914.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I have just read the letter in the issue of April 17, by M. D. Gibbs, and have noted his reference to material and its supply. As I have been making a clean-up of bridge and building material for the past three months on a large railway and have been securing figures from other roads to check mine, the subject is ocupying my mind at the present time.

I maintain that, speaking generally, this department (the bridge and building) is above all others the one that should be able to anticipate its requirements for the regular working season, and carry over the smallest amount of material stock, and its issues from stock on hand should show a higher percentage than that of any other department using large quantities of supplies, but investigation shows the case to be exactly opposite. Good railway store-keeping means the issuing each thirty days of material to the cash value of 45 per cent. of the balance carried forward. The bridge and building departments that I have investigated show an issue of from 5 to 10 per cent., and considering the work done and the men employed, they carry more than double the amount of stock carried by other departments. Why is this so?

The bridge and building man will tell you his business is "different." Sure it is. So do we all differ from each other, but this does not explain. The business of the bridge and building department is to maintain and erect bridges and buildings, culverts, platforms, docks, etc. The erection of new buildings is a thing usually decided upon months in advance, a bill of material is made up for each building, and the material is delivered on the ground where required. If the job is handled properly the finishing of the building should mean the use of all the material, leaving nothing to carry over. The same thing applies to a new bridge or a culvert, and the renewals of these structures should and can be figured on in advance each season, so that little or no material for important renewals need be carried over. This would leave only small repairs and renewals to be cared for from stock, and would mean a very small stock indeed compared with what we find in the hands of this department.

But the man with many buildings and wooden bridges asks: "How about fire and flood?" "Suppose we have an important bridge or building burn down?" Well now, how about it? How are we going to guard against delay in securing material to replace these? By carrying a bill of lumber, timber, etc., to enable us to duplicate any and all of your bridges and buildings? Surely not! I venture to say that there are not a dozen important buildings on any railway in America that if burned down to-morrow would be replaced by a building of exactly the same size and design, and the same applies to bridges, to a somewhat less, but still large, extent.

But the bridge must be replaced in some form at once. Very true, and there is no reason why the bridge and building man should not have sufficient piles, caps, stringers and ties to replace one or two bridges, over and above his regular season's requirements. But there is no good reason why he should carry a stock from which he issues ten per cent. or under monthly.

Then what is the matter with the bridge and building man? Well, so far as I know him personally, there is not very much the matter with him. I should say he shapes up with the rest of the "bunch" pretty well, but there is something wrong, and it is this: He usually has several bosses and he must try to please them all, and unfortunately for him, they are not all of the one mind. He must be a building man, a bridge man, a dock man, a tank man, a painter and several other things, but under the system generally followed, he must be a storekeeper also. Is it any wonder that he fails in something? And if he does fail, where would you expect to find that failure? Not in his bridge work, for that is where he would lose his head; nor his buildings or tanks, for then he would have his tail cut off just behind his ears; not in these, for these are what he is judged by; these are the things that keep his name on the pay-roll, so, as he is only human, he fails as a storekeeper, and small blame to him.

But this failure costs his company money the same as any other failure would, and the conditions under which he works should be changed. He has trades enough without the storekeeping. Cut that out, and place it in the hands of men trained for the work.

STOREKEEPER.

ABSTRACT OF ENGINEERING ARTICLES

THE following articles of special interest to engineers and maintenance of way men, and to which readers of this section may wish to refer, have appeared in the *Railway Age Gazette* since May 15, 1914:

Chicago & North Western Extension in Illinois.—The Chicago & North Western has recently completed a 90-mile extension into the southern Illinois coal fields. This line was built to high standards and almost entirely of permanent construction. It was described and illustrated in the issue of May 22, page 1141.

New St. Paul Tunnel Through the Cascade Mountains.—The Chicago, Milwaukee & St. Paul is now driving a tunnel 12,000 ft. long through the summit of Snoqualmie Pass by the European, or bottom heading, method and by company rather than contract forces. This project was described in an illustrated article in the issue of May 29, page 1183.

Canadian Bridge at Edmonton, Alberta.—The Canadian Pacific has built a double-deck structure across the North Saskatchewan river, with one railroad and two street car tracks on the upper deck and a highway on the lower deck. This structure was described and illustrated in an article by F. M. Patterson in the issue of May 29, page 1194.

New M. K. & T. Station at Houston, Tex.—The Missouri, Kansas & Texas has recently completed a new passenger station at Houston, Tex., which was described and illustrated in the issue of May 29, page 1203.

Canada's National Transcontinental Railway.—The general construction and operating features of the 1,805-mile line extending across eastern Canada from Moncton to Winnipeg, and which is now practically completed, were described in an illustrated article by D. MacPherson, assistant to the chairman, Commissioners of the National Transcontinental railway, in the issue of June 5, page 1221.

Pennsylvania Railroad Electrification at Philadelphia.—The Pennsylvania has started preliminary work on the electrification of its main line from Broad Street station, Philadelphia, west to Paoli, for suburban traffic as a means of relieving the congestion at the entrance to Broad Street station. This project is of unusual interest since it may be the first step in the electrification of the network of suburban lines in the vicinity of Philadelphia. It was described and illustrated in the issue of June 5, page 1243.

Construction of the Grand Trunk Pacific.—The western portion of Canada's new transcontinental line extending from Winnipeg to Prince Rupert, was described by F. M. Patterson in an illustrated article in the issue of June 12, page 1324. This line is interesting especially because of the low grades secured through the Rocky mountains.

New Northern Pacific-Great Northern Office Building.—The new office building now under construction for the Great Northern and Northern Pacific at St. Paul was described and illustrated in the issue of June 12, page 1340.

NEW BOOKS

Ballast. Size 6 in. by 9 in., 62 pages, illustrated, bound in cloth. Published by The Railway Educational Bureau, Omaha, Neb. Price $1.

This book was written as one of the lessons in the course on track work, but has since been bound separately for general sale. It describes in simple language the different kinds of ballast and their methods of preparation and insertion in the track. A number of standard roadbed sections, the organization and size of gangs, and the number of tools needed are given. The book is illustrated with 40 excellent photographs showing different stages in the preparation and placing of ballast, all of which were taken under actual working conditions, and are therefore more instructive than the photographs usually used. This book should be of interest and value to section foremen or others called upon to handle or supervise such work, as well as to more experienced roadmasters and maintenance officers.

Progress on the Federal Valuation of Railways

A Review of the Work Done to Date with a Resume of the Methods as Far as They Have Been Determined

Now that the Interstate Commerce Commission has actively started making a valuation of the steam railroad properties of the United States, the extent to which this work has progressed and the methods which are being worked out are of general interest. To gain a comprehensive idea of what has been up to this time it will be well to review briefly the early stages of the work, some of which has been referred to from time to time in our news columns.

This work has ben inaugurated in accordance with an act of Congress dated March 1, 1913, which provided that "the commission shall investigate, ascertain and report the value of all the property owned or used by every common carrier subject to the provision of this act." This act further stipulated that the original cost to date, the cost of reproduction new, and the cost of reproduction less depreciation, should be ascertained, and that an analysis of the methods by which these several costs are obtained and the reason for their differences, if any, should be given. The act required that work should be commenced within 60 days after the approval of the act and an appropriation was made to carry on the work for the first year. The law also required that the valuations be revised from time to time to keep them up to date.

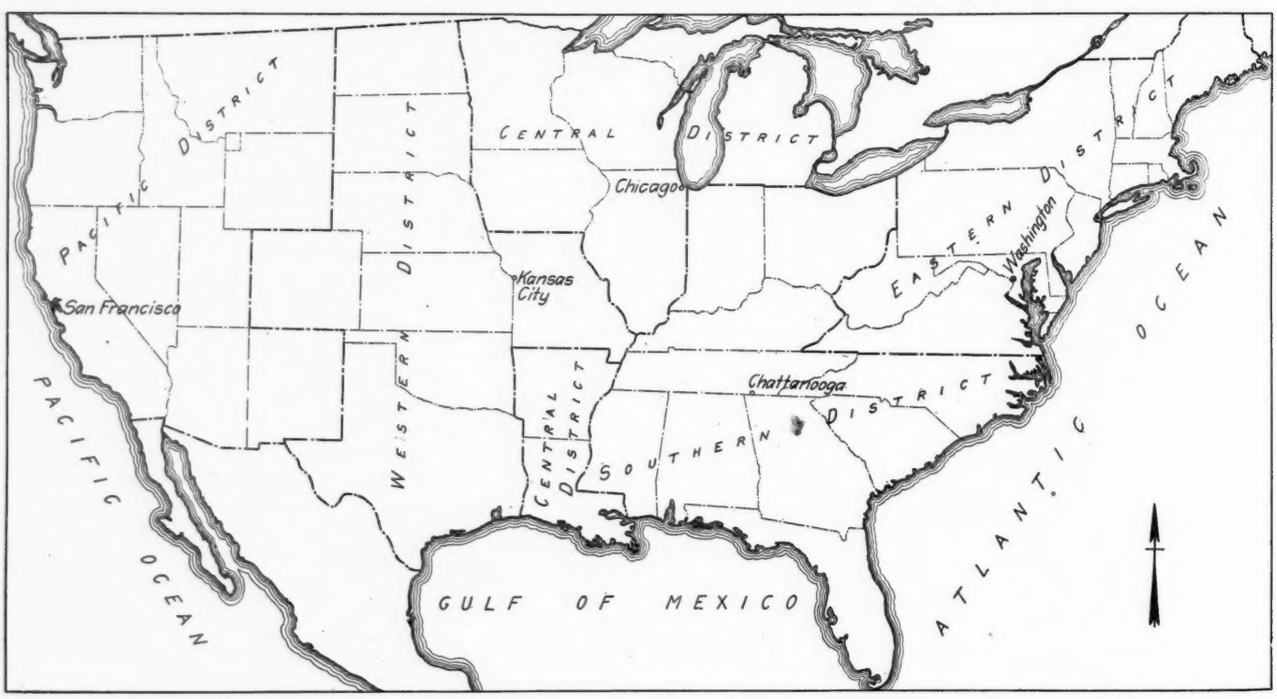
The act provided that this work should be done under the direction of the Interstate Commerce Commission. The commission promptly organized a department of valuation in charge of a director of valuation, and Commissioner C. A. Prouty resigned from the Interstate Commerce Commission to devote his entire time to this work as director. In this position he is the representative of the commission in direct charge of this work.

As the Interstate Commerce Commission is able to give very little time to the work of valuation an advisory committee was authorized in the summer of 1913 to advise with the commission and to suggest methods for carrying out this work. While working directly with the director, this committee reports to the commission. Although five members are authorized, only three have been appointed so far, these members being John Skelton Williams, Charles S. Staples and E. W. Bemis. This board has met monthly, except in April, 1914, and has discussed matters pertaining to valuation with the engineering board, those pertaining to accounting with the accounting board, and general matters of procedure with the director.

Under the director the work is divided between four general departments—engineering, accounting, land and law. The valuation act requires the commission to ascertain and report in detail regarding each piece of property owned or used by a common carrier. The larger portion of the work, therefore, falls upon the engineering department which has to make an inventory of the physical property and to note its condition as regards depreciation.

The country was divided into five districts having approximately 50,000 miles of main line in each district, the limits being shown in the accompanying map. An engineering board of five members was appointed over a year ago, and a short time later five district engineers were also appointed. All other employees in this service have been selected by civil service. Although immediately in charge of the work in their respective districts, the five members of the engineering board meet regularly to discuss the more important problems and act as a unit in these matters. The five district engineers devote their entire time to the work in their respective districts, and are directly in charge of this work at all times.

As all other employees were selected by the civil service commission, nothing could be accomplished in the organization of forces until the list of eligibles was given out by the civil service commission, the first list appearing in November, 1913. Following the receipt of these lists the successful candidates were all personally interviewed by the members of the engineering



Map Showing the Five Valuation Districts and Their Respective Headquarters

board or their district engineers and selections made in each instance from the three applicants receiving the highest rating, as required by law. As most of the men were not able to leave their previous positions without due notice, it was impossible to start active work until late in January of this year.

One of the first questions to be decided in sending out parties was the extent to which data already in the possession of the roads should be accepted. Many roads had made valuations for different purposes and several states, especially in the middle west, had required the roads to make valuations for their use. If the road's figures were accepted it would be necessary to check them closely, resulting, in many instances, practically in a re-survey. It was finally decided by the commission that to avoid duplication of the work, the carriers should be required to furnish maps and profiles as well as details of structures, and that the engineers of the commission should then proceed to measure up the property through their field parties, the railroad furnishing with each party a pilot in the person of an engineer of the same grade as the government engineer in charge of the party. The duty of this pilot is to call the attention of the government engineers to all property which might otherwise be overlooked and to represent the carrier on the ground. On one road at least, a chief pilot has been placed in charge of the pilots with the different parties to supervise their work and to assist in securing uniformity of action.

When fully organized the staff in each of the five districts will be composed of a member of the engineering board, a district engineer, an office engineer, a roadway and track engineer, a structural engineer, an architect, an electrical engineer, a signal engineer, a mechanical engineer and a telegraph and telephone engineer, in addition to the office and field parties as required. The roadway and track parties will consist of an engineer in charge, a recorder, an instrument man, a rodman, two chainmen, a tapeman and a computer. For bridge and structural work a party is organized consisting of a field engineer, a junior engineer and a tapeman.

Because of the magnitude of the work and the many problems without precedent, the board of engineers has been proceeding conservatively in the settlement of the various details. Specifications for maps and profiles outlining the nature of the drawings which the carriers will be required to furnish, the manner of their preparation and the information which they are required to show, were issued several months ago. Standard instructions to roadway and track field parties outlining the nature of the information required and the manner of its collection on the ground have also recently been issued. Similar instructions for the guidance of parties engaged in the inventory of buildings and structures, signals, and mechanical equipment, are also in progress of development, all of these various instructions being formulated after full discussion between the heads of the different divisions engaged in this work. A standard form of loose-leaf field note book has also been adopted by the engineering force and is now being supplied to the parties. The practice of taking carbon copies of certain field notes has been approved and it is expected that after being checked over in the district valuation office, the carbon copies will be sent to the roads. Unless objection is made within 30 days, these notes will then be accepted as correct. With this procedure it is hoped to remove all controversy as to basic quantities.

The roadway and track parties inventory and measure everything except bridges more than 16 ft. long, tunnels and other similar structures. For this purpose the party is divided into chaining and cross section parties. The first chains the track, noting mileposts, structures, etc., while the second party cross sections the roadbed accurately, following the general practice adopted by railroads when making contractor's estimates. The ballast is checked closely by cross section measurements, and every 500 to 1,000 ft. the depth is ascertained by test pits. The rail is calipered for wear and the brand and year laid are noted as well as details of the joints and fastenings. The structural party in general secures complete information regarding all structures over 16 ft. long, and tunnels, large buildings, etc.

As this work has only been under way a few months, arrangements for the care of men may be regarded as tentative. In some cases field parties have been securing accommodations at hotels and boarding houses through the country. In the southern district, boarding cars have been rented from one of the railroads, while in other cases Pullman tourist cars have been remodeled for use as camp cars. Two such converted cars are now in use in the Pacific district and one in each of the other districts except the eastern. The expenses of field parties are defrayed by the government.

In certain instances the roads have furnished space in their general offices for use of the government clerical forces engaged in the valuation of their lines. In some few instances the engineers have secured offices in the federal buildings. The endeavor is to be as close to the headquarters of the carrier as possible in order to have convenient and free access to the carrier's records.

In making the valuation it is required by the act of Congress that all valuations be divided by state lines. It has been further tentatively decided to subdivide the lines of the different carriers as between corporate owners; joint ownership or use; main line operating divisions; branch line operating divisions, and large terminal properties. In addition, further subdivisions may be made to cover sequence of construction, variation in topographic conditions affecting prices, etc. It is not planned to rigidly enforce the limits between the five districts, and small portions of lines extending into a second district will undoubtedly be handled by the district in which the major portion of the mileage lies. For instance, the central district is now making a valuation of all lines of the Chicago & Eastern Illinois, although a limited portion of its mileage lies in Indiana in the southern district. On the other hand, it is expected that the southern district will make the complete valuation of the lines of the Big Four, including the division extending to St. Louis in central territory. In this way the work will be simplified for the carriers and the government. All valuations now being made are of the date of June 30, 1914, although this date will probably vary as the work progresses.

In the eastern district two parties have been engaged in the valuation of the Norfolk Southern, about 800 miles, since March 1, and had completed 133 miles on May 1. Two additional parties were started on the Boston & Maine on this latter date.

In the southern district two parties were placed on the Atlanta, Birmingham & Atlantic late in February and a third party was added on April 17. Another party is now being organized to begin work on the Central Railroad of Georgia.

In the central district two parties started work on the New Orleans, Texas & Mexico late in February and completed the field work on this line of 176 miles on May 1. These parties, with two additional parties, are now working on the Chicago & Eastern Illinois, while it is expected that other parties will soon be placed on the Elgin, Joliet & Eastern.

In the western district one party started on the Texas Midland, 125 miles long, on January 14, and completed on April 30. A second party was placed on the Kansas City Southern in February, while two parties started work on branches of the Great Northern in North Dakota on May 4, on which date the party engaged on the work on the Texas Midland was transferred to a branch of the Minneapolis, St. Paul & Sault Ste. Marie in North Dakota.

In the Pacific district two parties started work on the San Pedro, Los Angeles & Salt Lake on February 1, and two additional parties were placed on this road on April 10.

Thus work is now definitely under way on 10 lines and it is expected that parties will be placed on the Big Four, the Chicago & North Western, the Western Pacific, the New Haven, and, perhaps, three or four other roads this year. Four parties

are now employed in each district, and it is expected that this number will be increased to 10 after July 1. It is hoped that 25,000 miles of line will be completely inventoried by the close of the next fiscal year, June 30, 1915. If sufficient appropriations can be obtained from Congress, the present organization will support 25 field parties in each district. Based upon the progress made to date, it is expected that outside of large terminals the field parties will average 1½ miles of line per day.

The accounting department will be in charge of one chief accountant in charge of the work in all five districts, although the man for this position has not yet been selected. A division accountant will be in direct charge of the work in each district and men have already been appointed to these positions. The accountant will work at the office of the road under survey, examining the records of original cost of construction, etc. Because of the very incomplete organization of this department, the nature of its work and the methods which will be followed are largely problematic at present.

The land department will be organized in general similar to the accounting department, with one supervisor of land appraisals in entire charge and a land attorney in each district. Only one such attorney has been appointed up to date.

The law department has been placed in general charge of a solicitor, who, at the present time, has two assistants. The principal duties of this department will be to study the corporate history of the roads and to prepare this information for the use of the other valuation departments.

Closely associated with the government forces in this work is the president's conference committee, representing the carriers, assisted by the engineering and land committees. These committees are divided into eastern, western and southern groups, and have met with the director and the board of engineers at frequent intervals to present the attitude of the carriers on many of the important subjects and to co-operate with the government in the preparation of the desired information. This committee is also endeavoring to formulate the standard method of procedure for the guidance of the roads in collecting their data.

SOME SERVICE RECORDS OF CARBOLINEUM WOOD PRESERVATIVE

Three long leaf yellow pine posts installed by the Missouri Pacific under the same conditions in stock pens at Pueblo, Colo., in 1902, were sawed off 1 ft. above the ground and removed in 1913. The first, which had been untreated, was almost entirely decayed. The second, which had been painted with one coat of Avenarius Carbolineum, was in somewhat better condition, and the third, which had had the lower 4 ft. of its length, including the 3 ft. that were to be set in the ground, immersed for 10 minutes in boiling Carbolineum, was practically as sound as when installed. These posts are 8 in. by 8 in. by 5 ft. long. All three posts were in excellent condition above the ground line, a characteristic which is common to timber exposed to the Colorado atmosphere.

The Hutchinson Interurban Railway, of Hutchinson, Kan., removed a number of wooden trolley poles in November, 1913, to replace them with steel poles. These wooden poles had been set in July, 1906, and it was found that those brush treated with Carbolineum were sound and fit for reuse. Similar poles installed in 1908 without treatment had rotted off at the ground line so that they broke in removing in November, 1913. This company finds the cost for material and labor for a light brush or dip treatment to be about $0.11 per tie and about $0.25 per pole butt.

The lighthouse service of the United States Department of Commerce has found that piles and timbers placed in a wharf at Portland, Ore., in May, 1902, which were treated by the open tank process with 100 lb. of Carbolineum per 1,000 sq. ft. of surface, were still in good condition on April 24, 1913. The piles did not show signs of decay where alternately exposed to the action of tide and air and the planking on the deck, which was exposed continually to rain and sun, was still hard and sound and showed little sign of the wear that would ordinarily be expected.

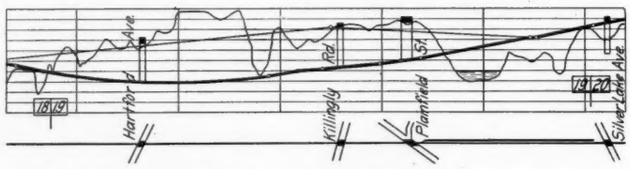
Service of Carbolineum treated wood on the Uganda Railway in Africa has shown that this preservative is a protection against the white ant. The same experience has been found in specimens of wood treated with this preservative which were used in cold storage houses for government supplies in the Philippine Islands. This product has been used for such buildings for the past six or seven years and the officers in charge report satisfactory results.

The San Antonio Brewing Association has used Carbolineum in treating the draft timbers on refrigerator cars and the company believes that this use has practically doubled the life of this wood.

THE COST OF GRADE SEPARATION

By H. C. Estep

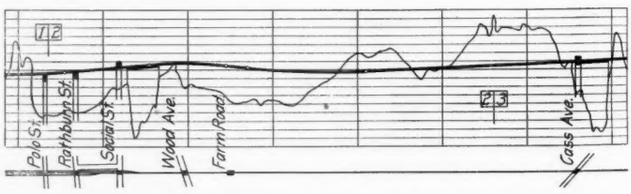
It is probable that all steam railroads built in the future in regions that are fairly well settled will be forced to separate the grades of all roads and streets, and it is practically certain that even should they be permitted to escape a portion or all of this expense the engineers will be asked to make an estimate of the cost of grade separation. It is hoped in this article to show this cost sufficiently closely to be used in estimates based either on a reconnaissance or on actual preliminary surveys. The contract



Profile of Section 19 Showing Effect of Separation of Streets in the Country on the Grade Line

prices used here were those of 1913. Owing to the small amount of railroad construction that year, these were a trifle below the average, but as the country traversed was Massachusetts and Rhode Island, the topography is rougher than is usually found, except in mountainous regions, so that this is a fair offset to the prices.

Two classes of work are considered; first, a region through the country with occasional small villages, and second, in the city, or at least in closely built up villages with many streets. Eight miles of this is taken in Rhode Island between Woonsocket and



Profile of Section 2 Through a City

Providence, and nine miles on what was called a freight line, mostly in Providence. This line skirted the city through property less valuable than that closer in, but still all closely built up. The streets were practically all in use and many of them were paved and carried car lines.

The Massachusetts work started at Palmer and ran easterly 20 miles to a point near Southbridge. In considering this work one large steel viaduct was excluded, as it was not thought that

the cost of this viaduct was increased on account of grade separation. The cost of a crossing of a state highway and an electric railway was also omitted for the same reason. The structures included in this first 20 miles were: eleven overhead timber bridges; eight timber subways under the railroad; one 70-ft. through plate girder structure on masonry; one 80-ft. deck plate girder on masonry, and one 105-ft. span over the Boston & Albany; a total of 22 structures.

The estimated cost of these, including an allowance of 10 per cent for incidentals, was $103,935, about $5,196 per mile; or about $4,724 per structure. The 19 wooden structures cost about $61,577, or an average of $3,241 per structure. Approximately $2,000 of this was for grading the approaches and $1,241 for the cost of each structure itself. Where the conditions were such that the extra material from the line excavations would grade the approaches to the highways, this grading was not considered as an expense due to grade separation. In other words, only such grading of the approaches as required to be paid for as borrow, or as waste from the excavations in the subways, if such was necessary, was estimated as a cost of grade separation.

In all of this 20 miles in Massachusetts, changes of the highway grades were permitted where necessary, and in some cases entire relocations of the highways were made. In no case was the rate or position of the grade of the railroad affected by the separation of the highway and railroad grades. This 20 miles may be taken as fairly typical of work in a rather hilly region, with summits to be overcome by the railroad, and with the topography of the country and the business of the line justifying maximum curves of 6 deg. and a ruling grade of 1 per cent.

Of the first 16 miles in Rhode Island, 8 miles could not be classed as city work. In fact it will be seen that the cost per mile of this 8 miles falls far below the average of the 20 miles considered in Massachusetts. In this distance of 8 miles there are only 6 structures required on account of grade separation. Four of these were wooden trestles and two were of steel and concrete construction. The total estimated cost of these 6 structures was $16,949, but to this should be added $4,800 extra for grading on account of the railroad grade line fitting the grade so badly in one place, bringing the total cost due to grade separation to $21,749, an average of $2,718 per mile for this 8 miles, or $3,625 per structure. Perhaps a better way to state this would be to say that the wooden structures cost a little over $1,100 each and the permanent ones over $6,000 each, exclusive of the $4,800 on account of grading the main line.

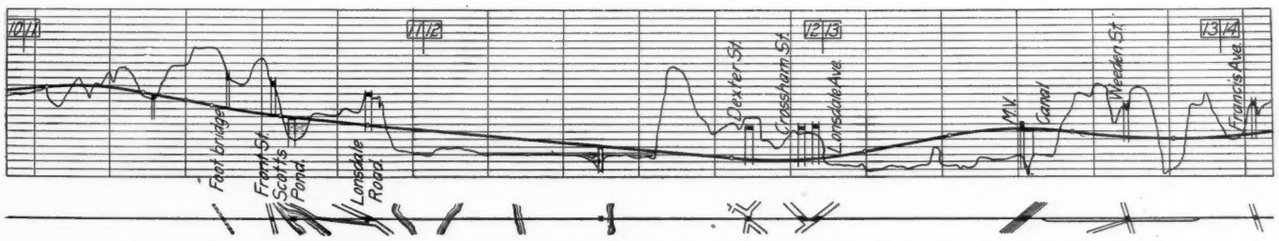
The other sections could be classed as city work. On this 8 miles there were 12 wooden and 14 steel and concrete structures, with an estimated cost of $237,426. To this should be added $26,400, the estimated increase of cost of grading the main line due to the ill-fitting grade line on section 2 and sections 11, 12 and 13, making a total cost of $263,826, or an average cost per mile of $32,978, which could be fairly charged to grade separation.

An inspection of the accompanying profiles is sufficient to show that the grading has been greatly increased by the separation of so many street grades. There was not sufficient material available, except from borrow, to grade the banks on section 2, and had the intersecting streets been out of the way the railroad grade line could have been much lower. On sections 11, 12 and 13, there was entirely too much excavation on account of having to dodge under the existing streets. Had grade crossings been permitted on only three of these streets, a balanced grade line could have been obtained.

The cost of the 12 wooden structures alone was estimated at $27,065, or an average of $2,255 each. The 14 steel and concrete structures were estimated to cost $210,361, or an average of $15,026 per structure including a concrete connecting wall which was classed as a structure. The cost of these structures ran from $6,587 to $63,355. This latter amount was for a viaduct crossing North Main street, the New Haven yard and the New York, New Haven & Hartford Railway.

On the 9 miles considered on the freight line there were 29 structures, including 4 structures over railroads. Fifteen of these were of steel and concrete and 14 were designed originally for timber construction. The estimated cost of the 15 permanent structures was $193,225 for the structures only, or an average of $12,881 per structure. The estimated cost of the 14 timber structures was $32,675, or an average of $2,334 per structure. The cost of the whole 29 structures was $225,900. To this should be added $28,500 for the increased cost of grading the main line due to the ill-fitting grade line on section 9, or a total of $254,400, which can be fairly charged to grade separation. It will be seen that this makes an average cost of $28,267 per mile.

An inspection of the profile of section 19 which has 135,000 cu. yd. too much excavation, shows how much the cost of the main line grading was here increased by having to separate the street grades. Without stopping to work out the grades in detail, it can be seen that a grade line something like the upper one shown would have saved at least as much as was allowed for the ill-fitting grade line.



Profile of Sections 11, 12 and 13 Showing Effect of Separation of Grades With City Streets on the Grade Line

To summarize, wooden crossings in the country average about $1,100 or $1,200 each; while wooden crossings in the city cost about $2,300 each, or nearly twice as much as in the country. This is all due to the increased length, as the local authorities insist on greater clearance for what they call a street, even though as in the cases estimated many of them were not using more than an average country road in width. The cost of permanent structures in the country will be about $10,000 each, while the cost of steel and concrete crossings in the city averages about $14,000 each. The whole cost of grade separation for country work runs about $3,000 to $5,000 per mile. As there were exceptionally few crossings in the 8 miles of Rhode Island work classed as country work, about $4,000 per mile is about what is likely to be the cost. The whole cost per mile of grade separation for city work is about $30,600. In "Cost Data," page 1303, Mr. Gillette gives the average cost per mile of grading 488 miles of the Great Northern line in Washington (and this crossed a range of mountains) as $11,343, so it will be seen that the cost per mile of grade separation in city work is nearly three times as great as the cost of grading on a line, a part of which is mountainous.

SIBERIAN RAILWAY DEVELOPMENT.—The Ministry of Railway and Communications in St. Petersburg has asked the Council of Ministers for a supplementary credit of $12,800,000, to be devoted to finishing work on the middle part of the Amur Railway, and also an extra $2,400,000 towards the carrying out of supplementary work which was not foreseen.

The Reconstruction of an Important Water Station

A More Favorable Location and an Improved Water Supply Have Greatly Improved Operating Conditions

By C. E. Lindsay
Division Engineer, New York Central & Hudson River, Albany, N. Y.

The Mohawk division of the New York Central & Hudson River crosses the divide between the Hudson and Mohawk rivers, in passing from Albany to Schenectady and then follows the Mohawk valley to Rome whence it climbs to the southern slope of the Oneida lake basin, which it follows to Syracuse. The waters of the Hudson and Mohawk rivers are comparatively soft and well suited to locomotive boiler purposes; the scale forming content varying from 2 to 12 grains per gallon and seldom exceeding 10 grains per gallon.

The principal water stations for freight trains and the sources of supply are as follows:

Miles from Albany	Station	Source of supply
3	West Albany	Hudson river tributary.
18	*Schenectady	Mohawk river.
28	Hoffmans	Mohawk river.
49	*Yost	Mohawk river.
63	St. Johnsville	Mohawk river.
78	*Herkimer	Mohawk river.
94	Utica	West Canada creek from above Trenton limestone formation. Mohawk river tributary.
108	*Rome	Mohawk river.
123	Oneida	Cowaselon creek.
134	Chittenango	Chittenango creek.

*Water pans also on two high speed tracks for passenger and fast freight trains.

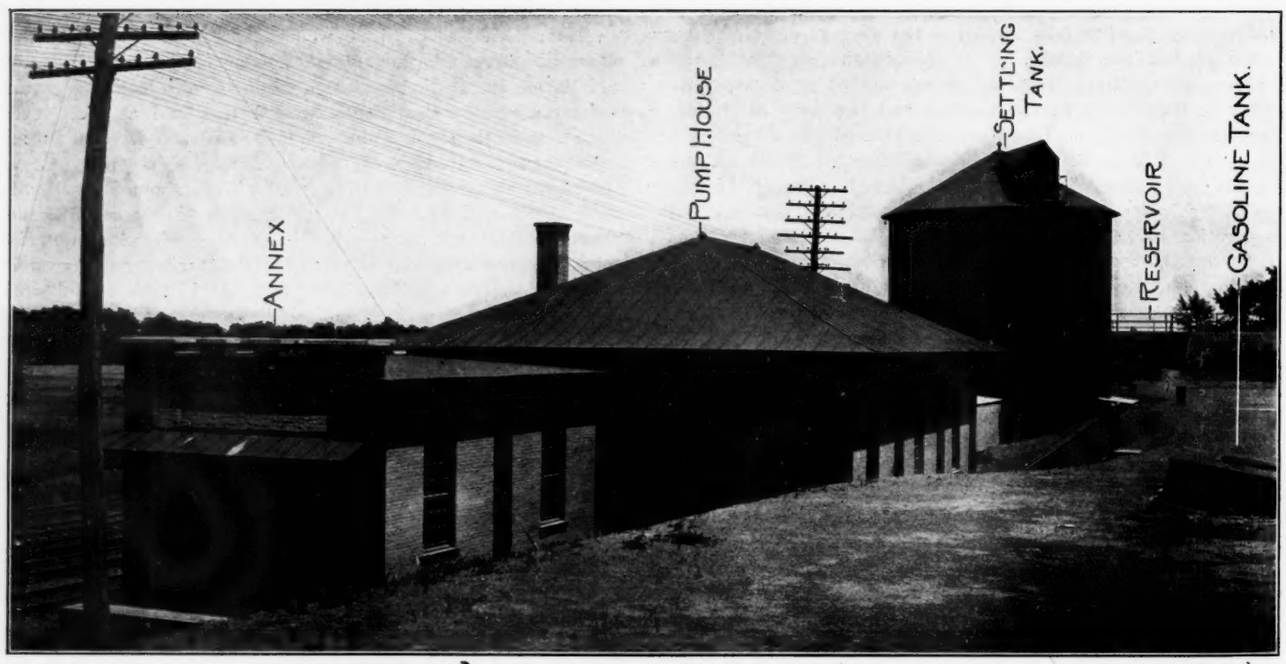
The principal tributaries of the Mohawk river, except Schoharie creek, drain the southern slopes of the granite formations of the Adirondack mountains and the Trenton formation lying along the north side of the river furnishes what elements of hardness the water contains, but is greatly diluted by the larger volume of water from the mountains. The southern drainage slope of the Oneida lake basin is quite steep and short and flows over the Helderberg formations for practically the entire length of the streams, so that the scale forming content is very high, varying universally with the rainfall. The stations at Oneida and Chittenango are supplied with water from this source, and the consumption of water at Oneida is about three times that at Chittenango. The scale forming content of these waters varies from 20 to 70 grains per gallon.

These two sources of bad water, located at the westerly end of the engine run between Albany and Syracuse, on which the water supply is otherwise very good, are objectionable and to overcome the difficulty a water softening plant has been established at Oneida which has many unique features. The location of the plant is shown in Fig. 1, which shows the four main tracks and a middle siding of the New York Central main line, and the two main tracks of the West Shore, which at this point is about 27 ft. higher than the New York Central and 500 ft. south.

Trains on the main line formerly obtained water at this point from the reservoir shown in Fig. 1, which was fed by a spring, but the supply was soon exhausted and water was then taken from the city supply at Oneida station, one mile east. This practice was objectionable because of the meagre supply of hard water, the obstruction of streets, and the presence of a sag in the grade at that point out of which eastbound trains were pushed. Trains on the West Shore were supplied with water pumped from Oneida creek, from which stream the city supply was also taken by gravity. The location of that water station was also objectionable on account of the station, streets and grades.

The new location permits eastbound tonnage freights on the main line to start down hill and get a mile run at a short controlling grade, reducing pusher service, and it also reduces the blocking and frequency of crossing of streets in Oneida; while on the West Shore it affords a summit starting point at a junction where there is less interruption of the traffic of the New York State Railways, which operates frequent electric car service by third rail system on the West Shore tracks.

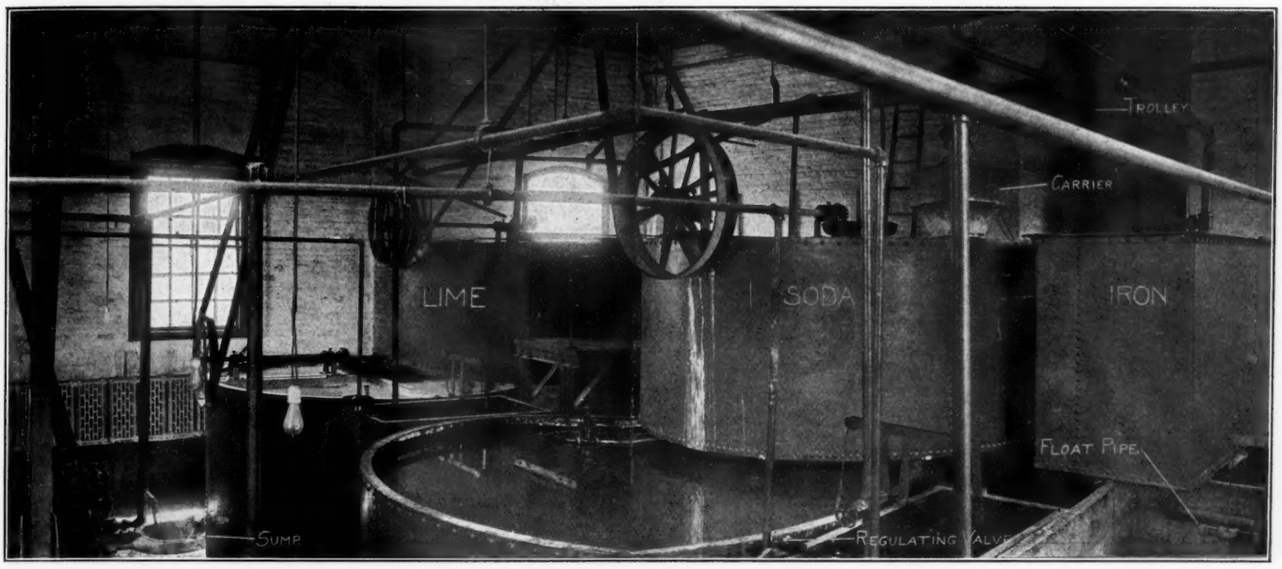
As the disposal of the sludge from a water softening plant is frequently a difficult and annoying problem, and as steam power



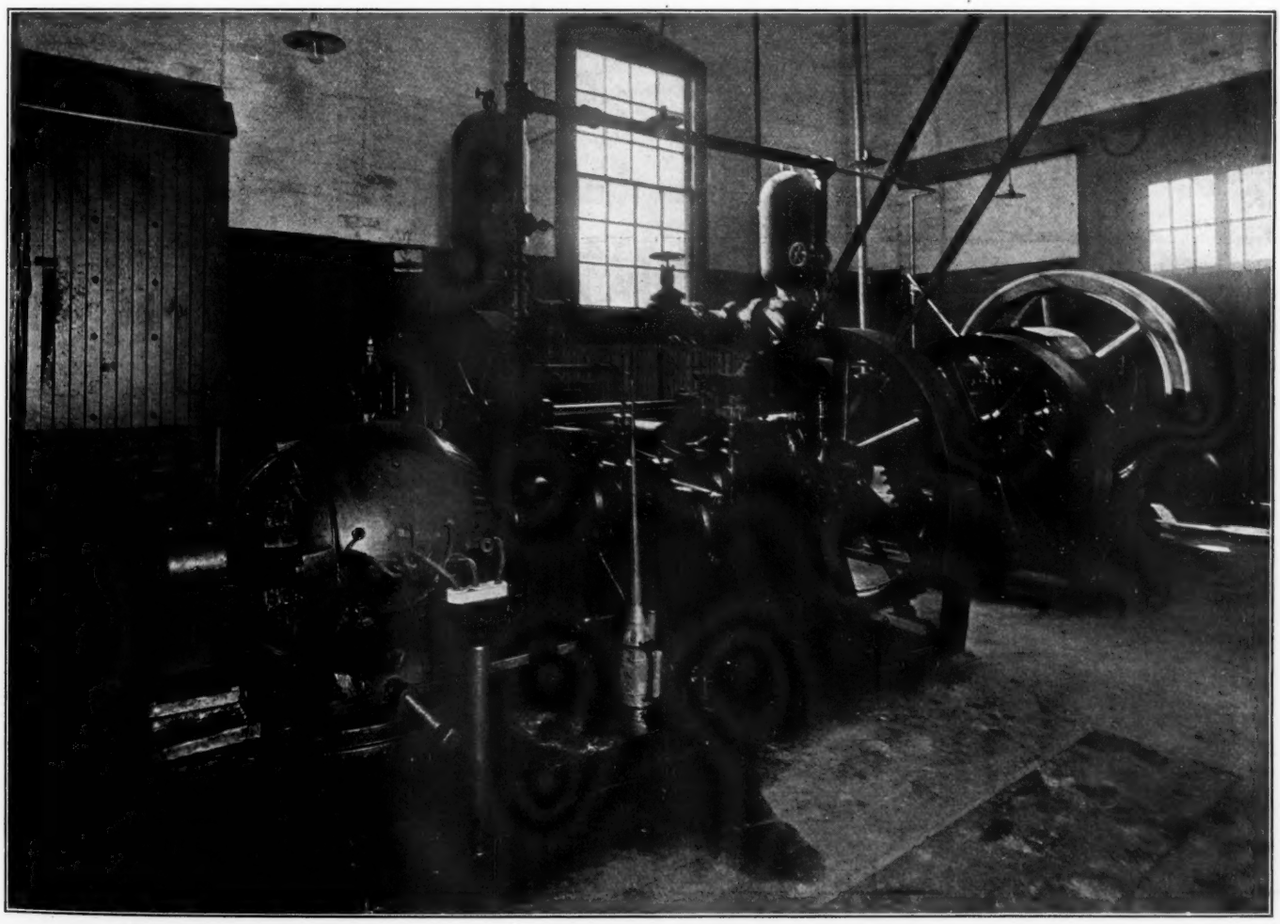
Rear View of the Pumping Plant

was not to be used, avoiding all questions of fuel and ashes, a site was selected close to the existing reservoir and between the main line and West Shore tracks, where the sludge can be disposed of without any difficulty and where the plant is out of the way of future tracks.

A low dam was thrown across Cowaselon creek at the point where the main line crosses it and the water conducted thence by gravity in a 12-in. pipe about 3,500 ft. long to a well near the pump house where any surplus could find outlet in a natural channel. The grade of the railroad descending eastwardly contributes to the economy of this arrangement. The pumphouse is 38 ft. x 54 ft. x 18½ ft. high at the eaves with a wing 18 ft. x 35 ft., alongside wich is a spur track on which supplies are received. The foundation and floors are of concrete, the walls of



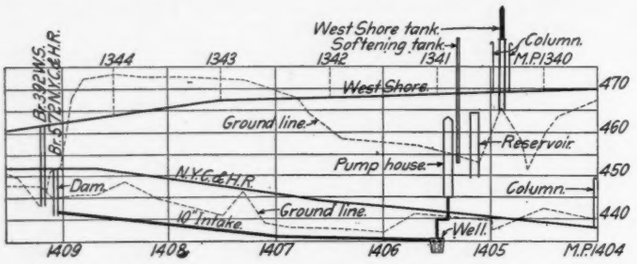
Interior of the Mixing Room



Interior of the Pump Room

brick and the roof of the main building is of tin, while that of the wing is of tar and gravel. The treating room is 30 ft. x 36 ft., the pumproom is 19 ft. x 21 ft., and the remainder of the floor space is occupied by storage rooms for lime, soda, iron sulphate and coal, and a hallway to reach them. An overhead trolley from which a differential pulley wheel and bucket are suspended affords convenient means of getting supplies from the storerooms to the mixing vats.

The water is treated by the Kennicott system and pumped to the steel settling tank, whence it flows by gravity into the reservoir for the main line supply, or is pumped to the 50,000-gal. storage tank on the West Shore side at the higher elevation and



Profile of Tracks and Pipe Lines at Oneida Water Station

thence to the water columns. Two of the main line water columns are located east of the pumphouse to take advantage of the additional head and to conform with train length. The West Shore columns are located with reference to the home signals of the interlocking plant controlling train movements at the junction.

The supplies are received usually in carload lots, the lime in bulk, and the soda in bags containing 300 lb. each. The building is lighted by electricity and is heated by a hot water heater located in the northwest corner of the treating room, using hard coal for fuel.

The pumping plant consists of two shaft and gear driven pumps with an electric motor on one end and a gasoline engine on the opposite end of the shaft, with intermediate clutches, so that either pump can be operated by either source of power or both can be operated simultaneously by its adjacent power. Electricity is obtained by a short branch from the 650-volt d. c. line supplying current to the New York State Railway cars and this voltage varies from 400 to 650 volts. Gasoline is supplied in drums and emptied into a reservoir on the bank in the rear of the building from which it gravitates to the engine.

A pulley on the pump shaft is belted to a line shaft revolving by the company. A small switchboard located along the north wall and a small testing outfit and desk complete the equipment of this room.

The Kennicott water softening apparatus has a guaranteed continuous capacity of 30,000 gal. per hour, with a reduction of the calcium and magnesium salts to less than five grains per United States gallon. The water softener is of the ground operated type, simple in design, requiring the minimum of labor in attendance. The following is a typical analysis of the water before and after treating:

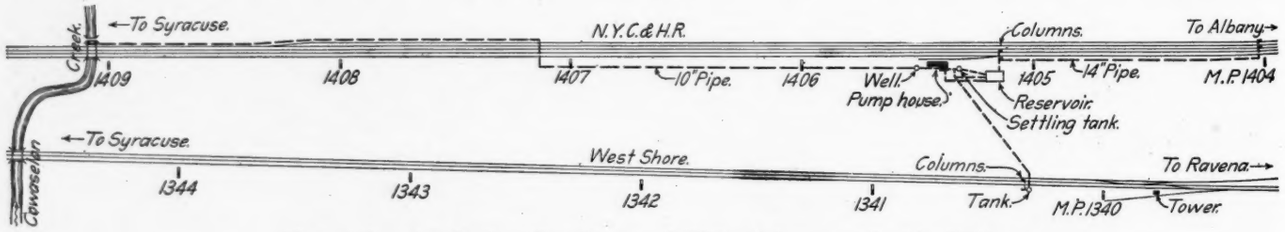
Elements	Raw Water. Grains per gal.	Treated Water. Grains per gal.
Oxides	.60	.34
Calcium carbonate	10.41	2.77
Calcium sulphate	27.71	.72
Magnesium carbonate	.....	1.02
Magnesium sulphate	4.38	.85
Magnesium chloride	.....	.....
Alkali sulphates	.....	17.00
Alkali carbonates	.....	.....
Alkali chlorides	.78	1.63
Total chlorine	.....	.....
Scale forming solids	43.10	5.70
Soluble salts	.78	18.63
Total solid residue	43.88	24.33
Hardness	36.0	4.0
Alkalinity	11.2	2.8
Causticity	.....	3.7

The simple testing outfit provided by the Kennicott Company is easily manipulated by the pumper who uses it three times and more daily while treating is in progress and makes report of each test. These tests are checked by the foreman of water stations at frequent intervals using a set of the same apparatus, and by complete chemical analysis of the raw and treated water made at the testing laboratory at the West Albany shops by the chemist and engineer of tests.

In the treating room there are three sets of tanks, each set comprising a dissolving tank, a mixing tank and a regulating tank. Each set is also provided with a sump and pump. One set is for lime, one for soda and one for ferrous sulphate as a coagulant. The dissolving and mixing tanks for soda and lime are provided with mechanical agitators equipped with clutches. These tanks are 11 ft. in diameter, 5 ft. high, of 3/16-in. steel supported directly on the floor or on iron columns and beams.

The regulating tanks for lime and soda are 2 ft. wide, 5 ft. long and 5 ft. high located on the floor alongside the respective mixing tanks. The coagulant dissolving tank is 5 ft. high, 4 ft. wide and 7 ft. long, of 3/16-in. steel. The coagulant mixing tank is of wood, 7 ft. long, 4 ft. wide and 5 ft. high.

The method of operating the agitators is shown in the accompanying interior view. The regulating tanks are shown alongside the circular ones. Each of these contains a float which is



Plan of Pumping Station, Pipe Lines and Water Columns at Oneida, N. Y.

200 revolutions per minute, turning the mixing machinery in the adjoining room. The motor is a 20 h. p. commutating pole type d. c. motor for 600 volts at 1,250 revolutions per minute.

The pumps are duplicates, with 8½ in. x 10 in. duplex pistons, plain fitted six-in. suction and five-in. discharge. One pump is supplied with extended base plate and double reduction gearing for direct connection to the motor. The other has no extended bed plate, but is driven by the motor through a three-jaw clutch on one side or by the 15 h. p. gasoline engine through the four-arm friction clutch on the other side, each being operated at 50 revolutions per minute. The gasoline engine is rated at 15 h. p. and makes 250 revolutions per minute. All the machinery was furnished by Fairbanks, Morse & Company, Chicago, and installed connected by a chain to a hinged pipe in the mixing tank. A valve shown at the lower margin controls the flow into the regulating tank. One of the sumps and triplex chemical pumps can be seen in the extreme lower left corner. The box and trolley for feeding raw material to the dissolving tanks is shown over the soda tank.

The main settling tank is 28 ft. 6 in. in diameter, 29 ft. high, on a circular concrete wall 12 in. thick and 4 ft. deep enclosing the natural Clinton shale formation which was made level and filled with sand. The wall projects 12 in. above the surrounding natural surface of the ground on the outside. The bottom and two lower courses of the tank are of 5/16-in. steel, double riveted and the upper courses are ¼-in. steel, single riveted, all conform-

ing to the requirements of the Hartford Steam Boiler Insurance & Inspection Company.

The interior cone of the sedimentation tank is of 3/16-in. steel supported on 4-in. pipe columns. Surrounding the top of the cone are two levels of perforated plates in sectors, being about 18 in. apart, and this space is filled with excelsior as a filter. At the bottom of the sedimentation tank there are two sets of spider pipes for drawing off the sludge. The flow from these spiders is controlled by jump valves located just outside the tank discharging onto some waste land. A coil of pipe in the top of the sedimentation tank connecting with the heater in the treating room furnishes sufficient heat to at least prevent the pipes from freezing.

In the operation of the plant, the water enters through the inlet pipe (which rises on the inside of the softener to protect it from freezing) and is discharged into the raw water box at the top of the sedimentation tank. The raw water box has four openings, a large one which allows the greater part of the water to enter the top of the conical downtake; and three smaller ones connected by pipes to the regulating tanks in the treating room.

As the regulating tanks slowly fill, the floats rise allowing the pipes in the mixing tanks to gradually lower, permitting the chemicals to flow to the sumps where they are mixed with softened water and pumped to the top of the conical downtake where they are mixed with the raw water. This process affords a means of proportioning exactly the amount of each chemical to the amount of the raw water, and the flow of the chemical varies automatically with the flow of the raw water within the rated limits of the plant.

The conical downfall permits the downward flow of the water, carrying its precipitate, at a constantly decreasing rate until it reaches the lower edge where the increasingly larger area between the cone and the surrounding tank reduces the speed of the upward flow, allowing precipitation to continue.

The excelsior filter at the top completes the process and the water passes off quietly by gravity into the adjoining reservoir. The sludge is removed through the sludge pipes above described.

This reservoir was originally 42 ft. wide by 83 ft. long at the top, and 8 ft. deep with sloping sides paved with brick and having a capacity of 170,000 gal. The sides were raised six ft. by vertical concrete walls, well bonded to the old masonry and banked outside, increasing the capacity to 300,000 gal. This reservoir of such large capacity affords additional opportunity for the sludge to settle. The average consumption in 24 hours has varied from 180,000 gal. to 220,000 gal., the maximum reaching 294,000 gal. The plant is operated by one man working ten hours per day, and the treated water costs less than five cents per thousand gallons, excluding interest and depreciation, and including cost of chemicals, electric power, gasoline, oil, tallow, waste, supplies and repairs, and pumpman's wages.

Some natural prejudice against treated water has been exhibited by some enginemen, but so far the experience and results are satisfactory. The installation permitted the abandonment of two steam operated and badly located plants, avoids the annoyance and danger of operation in city limits and improves train operating conditions at the same time effecting a marked reduction in operating expenses.

The general arrangement of machinery and the design and construction of the building and plant were under the direction of the writer, the treating machinery was furnished by The Kennicott Company, and the pumps, motors and engine were designed and furnished by Fairbanks, Morse & Company, all under the supervision of W. L. Curtiss, mechanical engineer for G. W. Vaughan, engineer maintenance of way.

TRAFFIC ON CHINESE GOVERNMENT RAILWAY.—The Peking-Mukden portion of the Chinese government railways in the first half of 1913 carried 1,908,032 passengers, and 1,998,497 tons of freight. The total passenger mileage was 152,515,943, and the freight ton mileage 216,013,194. The line is 608 miles long.

WORK TRAINS FOR CONSTRUCTION OR MAINTENANCE*

By M. A. Box

General Roadmaster, Kansas City Southern, Pittsburg, Kan.

It is necessary to draw a line between work trains on regular construction work and those unloading material for the maintenance of way department.

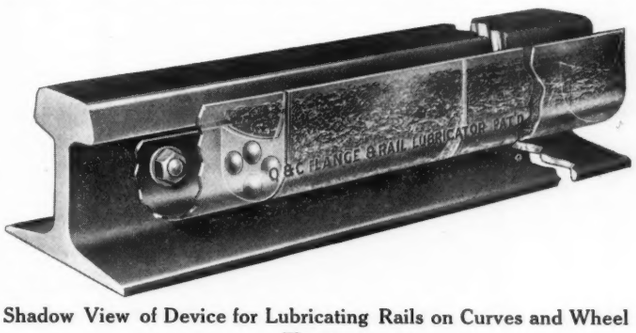
On construction work, the first thing to be considered is the territory which the work train will have to cover. Then the amount of material to be handled, and the number of laborers required can be determined. The despatcher should be notified in advance so that work orders can be issued before the train is due to start. This will avoid any delays in getting started.

A competent conductor should be secured and the full details explained to him, so that he can commence figuring out his plans from the time he starts. All instructions regarding the work must be given to the despatcher and the conductor in advance, and should be changed as little as possible so as to avoid any conflict or misunderstanding.

In using a work train to distribute maintenance material—to unload ties for example—sufficient material for one or more day's work should be assembled, and then the chief despatcher should be notified that on a certain date a work train will be required. It should be explained at what point work will commence, and approximately what miles will be covered on that date, or the length of time it will require between certain stations. The roadmaster should have his laborers assembled to go out with the train and should also arrange with each section foreman to be on hand at the end of his section with a list of ties required on each mile. Great care should be taken by the roadmaster to see that the ties are unloaded exactly where they are required, so as to avoid handling them twice. In order to get such material unloaded just where needed and to get the full benefit of a work train a large gang is not needed, as by having too many men there is a liability of getting ties unloaded where they are not needed and not getting a sufficient number where they are needed.

A RAIL AND FLANGE LUBRICATOR

In order to minimize the friction between the rails and the wheel flanges on curves to reduce both the rail and flange wear, a new lubricator has been designed by the Q & C Company,



Shadow View of Device for Lubricating Rails on Curves and Wheel Flanges

New York, N. Y., for application to the rails on the tangents approaching the curves. Each of these troughs which are of the form shown in the accompanying illustration, are 12 ft. long and made up in sections. They are packed full of discarded cotton waste that has been removed from journal boxes, this waste being soaked with ordinary black oil. As this waste comes up within a half inch of the top of the rail, the flange of each wheel passing over the trough gathers enough oil to lubricate the rail and flange.

*Received in the contest on The Proper Handling of Work Trains which closed December 27, 1913.

These lubricators have been installed on a few curves of the Empire United Railways in Syracuse, N. Y., where they are reported to have given good service for over a year. It has been the practice in this installation to distribute oil twice weekly by the track walker and it has been found that one gallon of oil will supply two curves for two months. The cotton waste requires replacing at intervals of about one month.

A LEHIGH VALLEY SECTION HOUSE

Increasing interest is being manifested by a number of roads in the character of the accommodations provided for the track employees, especially at points where such accommodations are not readily available in neighboring communities. The Lehigh Valley has recently adopted a new type of section house for the use of its foremen and laborers which is considerably above the average standard of such structures throughout the country. One such structure has already been completed at Williamsville, N. Y., while another is now about half completed at Stafford, N. Y., and others are about to be built at five other points along this road.

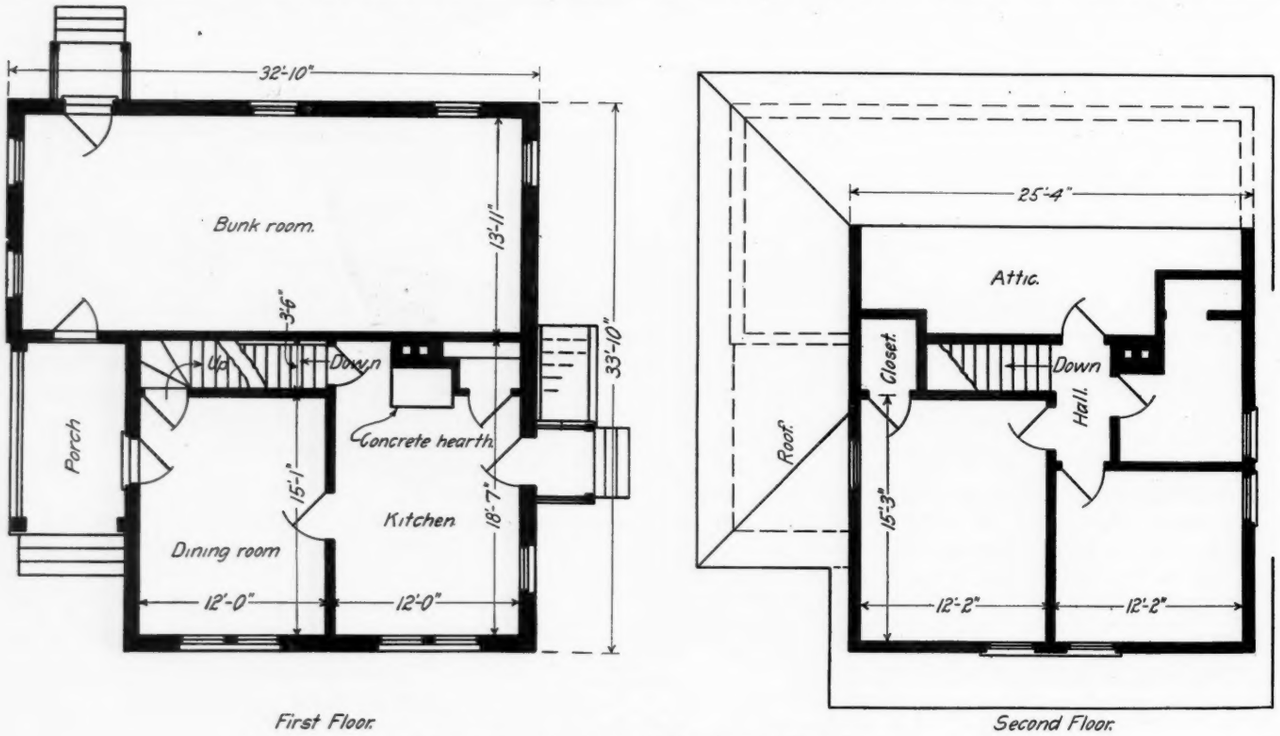
A Lehigh Valley Section House

The structure at Williamsville is 1½ stories in height and is constructed of "Natco" hollow tile building blocks with "Ednem" buff colored rock asbestos, stucco finish, and supported on concrete foundations. On the first floor are located the kitchen and dining room and also the bunk room for the laborers. On the second floor there are three rooms and an attic for the use of the foreman and family. Red quarry floor tiles are used for the bunk room floors, while yellow pine floors are laid in the rest of the house. The bunk room is plastered with two coats of Portland cement mortar troweled to a hard finish and waterproofed, while a three coat ready-mixed hard wall plaster is applied to the balance of the building. The building will be heated with stoves and is provided with a cellar for the storage of coal, etc. It cost about $3,750.

THE PROGRESS OF WOOD PRESERVING IN 1913

The most notable progress in the wood preserving industry which has yet been made was recorded in 1913 according to statistics compiled by the United States Forest Service in cooperation with the American Wood Preservers' Association and published in the annual proceedings of the association recently issued. The figures are based upon returns from 93 wood preserving plants, of which 58 are so-called commercial plants and 35 private plants, including 26 operated by steam railroads.

The total consumption of creosote oil by these 93 plants in 1913 was 108,373,359 gal., an increase of 29.5 per cent over the previous year. The similar figure for dry zinc chloride is 26,466,803 lb., an increase of 27.5 per cent. Miscellaneous liquid preservatives to the extent of 3,885,738 gal. were used, which is an increase of 26.4 per cent over the previous year. The rapidly increasing consumption of preservatives in the United States warrants the serious consideration of the sources of supply. Domestic manufacturers supplied only a little more than one-third of the demand for creosote in 1913, the remainder coming from foreign countries. While the total amount of domestic oil produced has been increasing in recent years by nearly 10,000,000 gal. per year, this



Floor Plans of Lehigh Valley Section House

is not sufficient to meet the needs of the preserving plants. It is doubtful whether the production of domestic oil will continue to develop at the same rate unless stimulated by higher prices. It should be noted, however, that new plants for the manufacture of creosote oil are being erected in the middle west and that these plants will add ten or more million gallons annually to the available supply of domestic creosote by 1915, if present plans materialize.

In Great Britain constantly increasing amounts of tar are being used for road making and as this tar is not distilled the tendency is to reduce the quantity of creosote oil manufactured in the British Isles. The development of the Diesel oil engine in Germany and the lack of an adequate supply of fuel oil in that country has resulted in a strong agitation for the burning of creosote oil in Diesel engines. Many factories and other users of fuel oil have found that it is more economical at times to purchase creosote oil than fuel oil. In spite of this situation, however, it is believed that fuel oil prices are now abnormal and while some of the large importers are of the opinion that there will probably be a shortage in foreign creosote oil for six months to a year, they believe conditions will likely be more normal after that and the increasing needs of the industry in this country will readily be met.

The 93 preserving plants covered in the report treated 153,613,888 cu. ft. of material in 1913, or 21.9 per cent more than in the preceding year. The 58 commercial plants treated 27,000,000 cross ties, 10,000,000 lineal ft. of piling, 132,000 poles, 98,546,000 board ft. of timber including primarily switch and bridge timbers, 13,692,000 board ft. of miscellaneous material and practically all of the cross arms and paving blocks which were reported. The 35 private plants treated 7,500,000 hewed cross ties, 5,000,000 sawed cross ties, 1,388,000 lineal ft. of piling, 16,000 poles, 41,000,000 board ft. of timber and nearly 11,000,000 ft. of miscellaneous material.

The railroads are now purchasing about 135,000,000 cross ties annually, of which more than 40,000,000 were treated in 1913. This is the greatest gain yet made in a single year. In 1913, 31,698,104 hewed ties and 8,562,312 sawed ties were treated. Nearly half of the cross ties which were treated in 1913 were handled in the plants of the interior eastern region. Approximately one-fourth were treated in the southern coast region. The treatment of ties, however, forms an important part of the treating plant activities throughout the country. The following tables show additional details of the records made in 1913:

CONSUMPTION OF WOOD PRESERVATIVES BY THE TREATING PLANTS IN THE UNITED STATES

Year	Number of plants	Creosote. Gallons	Zinc chloride. Pounds	Other preservatives. Gallons
1908	64	56,000,000	19,000,000	.....
1909	64	51,431,212	16,215,107	.....
1910	71	63,266,271	16,802,532	2,333,707*
1911	80	73,027,335	16,359,797	1,000,000*
1912	84	83,666,490	20,751,711	3,072,462*
1913	93	108,373,359	26,466,803	3,885,738*

*These figures represent the liquid preservatives in gallons for the respective years. The chemicals, as corrosive sublimate and aluminum sulphate, are reported in pounds. They are not listed for the identity of firms would be revealed.

RELATIVE AMOUNTS OF DOMESTIC AND IMPORTED CREOSOTE USED IN THE UNITED STATES

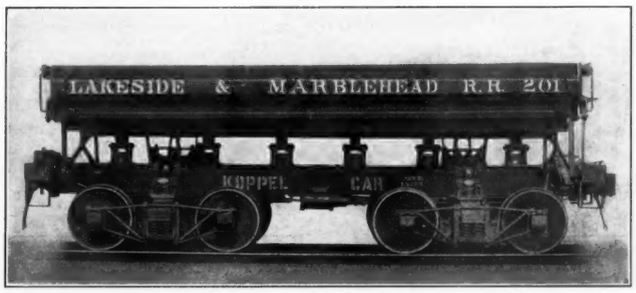
Year	Total gallons creosote used	Domestic creosote		Imported creosote	
		Gallons	Per cent. of total	Gallons	Per cent. of total
1908	56,000,000	17,360,000	31	38,640,000	69
1909	51,436,212	13,862,171	27	37,569,041	73
1910	63,266,271	18,184,355	29	45,081,916	71
1911	73,027,335	21,510,629	29	51,516,706	71
1912	83,666,490	31,135,195	37	52,531,295	63
1913	108,373,359	41,700,167	38	66,673,192	62

AUSTRIAN RAILWAY ABANDONS OIL FUEL.—It is announced from Vienna that the authorities of the Austrian North Eastern Railways have decided to give up the use of oil firing on the locomotives, except on those sections of the system where there are steep grades and many tunnels. The decision to adopt oil was arrived at about five years ago, when some 800 locomotives were adapted for burning liquid fuel. The work of converting these engines to coal firing again has already been commenced.

A NEW DESIGN OF DUMP CAR

A new design of all steel dump car has recently been built for the Lakeside Marblehead Railroad by the Orenstein-Arthur Koppel Company, Pittsburgh, Pa. The underframe and end sills have been made especially heavy and conform to the requirements of the Interstate Commerce Commission, allowing the cars to be moved on their own wheels in trains consisting of heavy standard gage equipment. The ends are of steel plates reinforced by six heavy gussets which are riveted to the long beams. The floor is of wooden planks which can be replaced without disturbing the frame of the car.

The doors are of steel plates inside and out with wooden filler



All-Steel Dump Car of 12-yd Capacity

beams to combine the elasticity of wood with the strength of the steel. The doors are held in position by an automatic locking device consisting of a heavy cast steel hook at each bolster, which engages downward projecting links on the car. These hooks are operated by levers placed on the end sills at diagonally opposite corners of the car. When the car is returned to the upright position after dumping, the doors are locked automatically.

SMALL CAST IRON BUILDINGS

The Paul Dickinson Co., Chicago, is now manufacturing small buildings of cast iron for use as watchman's houses, telephone

A New Type of Small Sectional Cast Iron Building

booths, oil houses, toilets, etc. These buildings are made of cast iron in sections so that they may be easily erected along the right

of way without the use of derricks or other heavy special machinery. They should also last indefinitely and require practically no maintenance or painting. The sections are provided with holes for assembling and all joints fit snugly while they are designed to be waterproof.

The buildings are made either six or eight sided to secure the maximum floor space for the smallest wall circumference. All of the side panels are interchangeable so that any one of the panels or sides can be taken out and replaced at any time. In this manner the buildings can be made larger by simply adding complete additional units. Ventilating space is provided in the roof while light is provided either in the door or in the roof, although if placed in the roof it is not so likely to be broken. The building rests on cast iron feet which have sufficient bearing surface to support the building on ordinary ground, thus making any special foundation unnecessary. Where intended for ordinary usage, a wood floor is provided. Because of their sanitary and cleanly construction, one particularly desirable use of this type of building is for toilets, in which case a cast iron floor is used. These buildings are also fireproof, which is an important point with small railway structures of this character.

A REINFORCED ASPHALT SHINGLE

A new asphalt shingle of ready roofing built up to reinforce the butt end has recently been placed on the market by Bird & Son, East Walpole, Mass. The Illinois Central has just purchased 7,000 sq. ft. of these shingles for a new passenger station at Starkville, Miss., and 8,000 sq. ft. for a new depot at Independence, Ia. Both of these structures are of brick and concrete, requiring a permanent, fire retarding roof of good appearance. The Chicago Great Western has just applied a roof of these shingles on a new station of similar type at Berwick, Ia.

These shingles are made from Paroid roofing, which has been manufactured by this company for a number of years and applied in rolls with satisfactory results. One of the most striking examples of the service of this material is the fact that when the Chicago & North Western tore down the trainshed at its old terminal in Chicago in 1911 the Paroid roof which had been laid in 1903, was found to be in such good condition that it was used again on small station buildings.

The shingles were first made 8 in. by 12¾ in. in size with the edges cut away slightly for about 4 in. next to the butt to give an attractive spacing between the shingles and allow them to lie close together above the cut. It has been found advisable, however, to double the width of the shingles, making them 12¾ in. long by 16 in. wide, using the single ones only for finishing along the edges. In the double shingles the edges are cut away as described above and a slot is cut in the middle of the shingle, giving the roof the appearance of being laid with 8 in. shingles. They are made of single ply roofing which is folded back at the butt for a distance of 8¼ in. covering an intermediate layer of the same material laid at right angles to the length of the shingle. These layers are cemented together with asphalt compound, making the butt three times as thick as the point and eliminating the exposed edges which could fray or curl up at the corners.

The shingles are put up in bundles of 113 each. A surface of 100 sq. ft. requires 226 of the double shingles, the weight for this area being 176 lb. The shingles are laid with 4 in. exposed to the weather so that the roof is always covered with 7 layers of the roofing material. They are nailed about 6½ in. from the butt end with large headed galvanized roofing nails. In color the shingles are a dark gray which becomes deeper as the soapstone dust which is sprinkled over them to prevent their sticking together is washed away by the weather. The color and the cutoff effect give them almost identically the same appearance as a slate roof.

These shingles are said to cost approximately $5 per 100 sq. ft. less than slate, asbestos or tile, and as they will not crack even under extreme weather conditions, the cost of maintenance should also be reduced. It is also claimed that the reinforced butt eliminates the annoyance of flapping in the wind, the danger of catching fire from flying sparks along raw edges, and the deterioration caused by fraying on the exposed edges and curling up at the corners.

TWO WAYS OF HANDLING WORK TRAINS*

By August Frederick

Steel Gang Foreman, Chicago, Milwaukee & St. Paul, Elgin, Ill.

The following is an illustration of the manner in which I saw work trains handled on one road during the past summer. The train was supposed to arrive at 7 a. m. to take the men out to work, but it was sometimes delayed as late as 8:30 a. m. by the engine not being ready or by the necessity of holding the train on a side track to allow other trains to pass. Upon arrival, the conductor had to get his work orders, requiring 10 to 25 minutes. Frequently, almost as soon as the train arrived at the work it was driven in by some other train. If this train happened to be the way freight, the work train was held on the siding until all the switching was done, consuming from 20 minutes to one hour. About 11 o'clock the engine had to go for water, consuming at least one hour. After dinner the work train would return to the station to switch cars for 30 minutes to one hour. At 6 o'clock in the evening the train was set out on the siding and was found buried between other cars the next morning, or it was sometimes set out so that the engine had to cross the opposite main track to reach it and was delayed waiting for passenger trains to pass. The conductor did not keep a record of the cars and the engine was out of repair almost a third of the time and was the source of much delay, so that some days when the gang had a good chance to work it was unable to get cars to load with material. After considerable experience of this nature the foreman finally gave up in despair.

In contrast to the above experience, which is by no means unusual, I believe the following measures would remedy the difficulties. The work train should consist of a good engine capable of handling all the cars necessary with a crew consisting of an engineer, fireman, conductor and three brakemen. This crew should be in charge of the train during the entire season. There should also be a foreman with a sufficient number of men to do the work required. The foreman should handle the air hoist when loading rails, should instruct the men to do the work properly and to prevent them from being injured, and should also keep a correct record of all material handled. The engineer and fireman should be with the engine at all times, while the men are working, while the conductor should see that one brakeman is stationed in each direction to enable trains to cross over if working on double track. The third brakeman should be stationed with the work train to give the proper signals.

The train should arrive at the station by at least 6:30 a. m., so that the conductor can get his working orders, do all necessary switching and have the train ready to leave promptly at 7 o'clock. He should also have his cars switched ready for work at 10 o'clock and on coming in at 6 o'clock in the evening, he should switch his cars ready for work the next morning. The train should be set out on some siding where it can be reached without delay and without crossing over the main track against the traffic to reach it. The conductor should keep a record of all cars loaded and unloaded, and of all material shipped and received by work trains. If a way freight or any other train driving in the work train has any work to do at the station it should be required to pull up far enough to let the work train go out to work again. The foreman of the work train should keep the conductor fully informed of all cars needed so that the conductor can arrange for them promptly to avoid loss of time for the gang. The work train should be provided with a coach in which the men may ride going to and coming from work, as a conductor will frequently refuse to let the men ride in the caboose, and they are liable to accident when hanging onto cars or an engine.

*Received in the contest on The Proper Handling of Work Trains which closed December 27, 1913.

Drag Line Excavators in Railroad Construction

A Discussion of the Advantages of This Type of Equipment Over Other Machines for Certain Work

By G. N. Crawford, Jr.

The drag line excavator is in increasing demand for railroad construction, as engineers and contractors are becoming more familiar with the possibilities of this type of machine, as regards its flexibility, yardage output, and cost of operation. Drag line excavators have been used commercially for the past 12 years and their use on railroad work reaches as far back as 1903. They have been employed in railroad construction for building fills, as well as making cuts, and in some cases are being used as pile drivers and derricks for handling temporary track, and other materials when necessary.

The drag line excavator resembles a revolving derrick; the engine platform and the engine house, including the machinery and boom, being connected and revolving on a turntable of the turret type, which is supported on a lower frame or car, mounted on trucks, truck wheels or maple rollers, as the occasion requires. The material used in the construction of the main structure of these excavators may be either steel or timber. The machinery is especially designed and built with reference to strength and durability, as well as speed and power. The bucket used is of the scraper type. It is operated by the bucket machinery on the excavator, through two wire cables, viz., the hoisting rope and the drag line rope. The bucket is filled by being dragged through the ground toward the excavator and when filled, it is lifted by the hoisting rope, which passes from one drum of the bucket machinery over a sheave at the outer end of the boom. After this operation the boom and entire upper frame are swung over the point where it is required to dump the bucket. There are several devices for dumping, all of which are built with a view of assuring a quick and positive unloading, as this is very necessary in sticky or hard material. The drag line excavators are operated by steam, electric, or gasoline power. The crew consists of two men, an engineer and fireman, in the case of the steam machine, and an engineer and oiler in the case of electric and gasoline power.

A Typical Drag Line Excavator

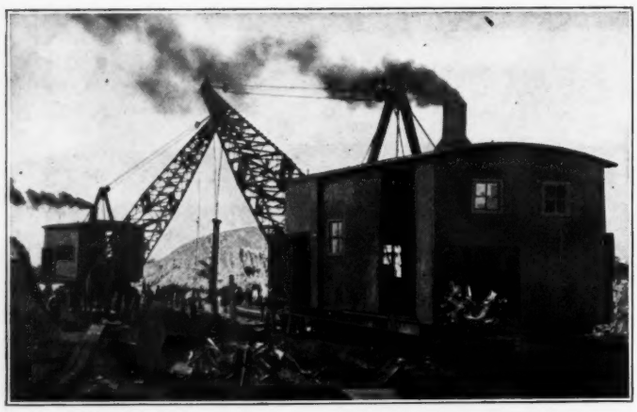
In building fills, the drag line excavator has several points of superiority. It accomplishes its work while sitting on the ground level, so that it is not affected by inclement weather or water in the pit. Owing to the fact that it can dig and deposit material at any point within the complete circle, its radius of action is greater than that of a steam shovel. The long boom allows the drag line excavator to construct a high and comparatively wide fill, securing the material from a shallow borrow pit, which is impossible with a steam shovel. The depth and the width of the borrow pit are naturally governed by the length of the boom. As the drag line excavator can dig and deposit material at 180 deg., its radius of action is approximately twice the length of the boom. A 60 ft. boom machine, for instance, would have a working radius of approximately 130 ft. The ordinary large steam shovel of the railroad type has a radius of action of possibly half this distance. The large radius of action of the drag line excavator eliminates the use of cars and dinky locomotives in large measure. The largest drag line excavator, which is being constructed at the present time, having a boom 125 ft. long, will be able to deposit material in the fill at a maximum distance of 275 ft. from the place at which the bucket was filled.

In excavating railroad cuts the drag line excavator shows the same adaptability. The cut is dug in practically the same manner as the borrow pit in the case of a fill. The excavator works on the original ground level, backing away as the cut is completed and depositing the material at a distance great enough from the cut to prevent slides or caving in the future. The complete control of the bucket which the operator has.

enables him to establish slopes in the cut which are smooth enough to avoid the necessity of any hand trimming afterwards without any extra effort on his part. The drag line excavator can be used in cuts om comparatively great depth. It is known to the writer that an excavator having a boom 60 ft. long, excavated a cut 52 ft. deep and deposited the material fully 60 ft. away from the top of the slope of the cut, this spoil bank having a height of 25 ft. The surplus material was loaded into wagons. If a steam shovel had been used it would have been necessary to introduce some conveying agency.

A drag line excavator is often required to handle material that is not stable enough to hold up the weight of a machine, requiring some bracing agency, such as piles driven into the ground. This would ordinarily require a pile driver, in addition to the digging machine, but with the drag line this is not the case, as it can be used as a pile driver. One of the accompanying illustrations shows two drag lines having booms 70 ft. long, driving piles prior to the construction of a concrete bridge over a canal in Florida. It is also often required that the drag line excavator be used as a derrick which can easily be done, inasmuch as the basic principle of the machine is the revolving derrick.

It has been the opinion of many engineers that this type of excavator is not built for digging hard material. An accompanying illustration demonstrates that a drag line excavator will dig rock and handpan without the use of any agency for breaking up the material before it is dug. In at least 75 per cent. of the railroad construction work on which drag line excavators are applied, more or less handpan and forms of shale and loose rock are encountered, and this hard digging is being accomplished successfully and economically. In dumping its load into the fill the drag line excavator bucket drops the material a sufficient distance to cause an impact, which packs the material in the fill more solidly than is the case where dump cars are used for spoiling the material.



Two Excavators Being Used as Pile Drivers

It has been brought to the writer's attention by several railroad contractors that this class of work can be accomplished more economically with drag line excavators, where the fill and borrow pit are adjacent, than with the steam shovel, for the reasons above given. In addition to the crew of the excavator, only two ground men are required near the machine at the time it is moving, inasmuch as it handles its own track.

The yardage output of these machines is of course dependent upon the organization around it, and the class of material which it is digging. The writer considers one bucket full per minute a conservative estimate of the output of this type. This would necessarily cause the output to vary with the size of the bucket.

It is not the intention to give the impression that there are no classes of railroad construction work on which the drag line excavator cannot be used to better advantage than any other type of digging machinery, but under conditions similar to these outlined, it is thought that these machines can prove themselves more adaptable than any other type of digging machine on account of their flexibility, radius of action and capacity.

A Drag Line Excavator Working in Very Hard Material Without Blasting

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INTERLOCKED SIGNALS IN INDIA.—In 1903 there were 14 interlocked stations with 60 towers upon the Great Indian Peninsula Railway, while at the close of 1913 there were 270 interlocked stations with 461 towers. Single line interlocking has not been by any means the Great Indian Peninsula Railway's only effort in this direction; 111 miles of double track from Khandwa to Itarsi, with 24 stations and 40 miles of double track from Lonavla to Poona with 10 stations, have also been equipped. Many complicated yards have been dealt with, notably Igatpuri, Bina, Itarsi, Bhopal, Delhi, Muttra and Jhansi. Jhansi is a junction of four lines, and the freight working is of a complicated nature; however, the special design adopted, with classifying gridirons, etc., has been found to work well. The passenger yard is completely interlocked. There are three towers—the north with 65 levers; the station with 18 mechanical and 18 electrical levers; and the south, with 77 levers. The four tracking of the lines from Bombay to Kalyan involves interlocking of an interesting character. From Byculla, where the four tracking starts, to Kalyan, where it finishes, there are no less than 81 towers, of which 16 are for through lines, 25 for the local, 22 for freight lines, and 18 for combined operation; the total leverage all through working out at 2,164 levers.

Practical Rules and Hints for Switch Connections*

A Collection of Valuable Points for the Supervisor or Foreman When Laying Out Switches and Ladders

By W. F. Rench
Supervisor, Pennsylvania Railroad, Tacony, Pa.

There is certain information essential to the correct installation of switch connections which it is necessary for the supervisor to have at his instant command and quite desirable for such of his foremen as have frequent occasion to perform this class of track work. The supervisor is required to lay out switch work on the ground when access to tables may not be possible, or to instruct his foreman when a resort to memoranda would be inappropriate. The track foreman cannot always have the benefit of the supervisor's guidance and at any rate when equipped to proceed upon his own working knowledge he naturally feels a greater degree of interest in the undertaking. There are not a few track foremen who are quite resentful of the intrusion of detailed directions for specific cases, but who are entirely willing to be instructed in the general rules necessary for nice accomplishment. This is especially true of switch connections, for which, unfortunately, there is much misleading data extant. Heretofore only the mathematically educated have been able to solve the various problems of switch work, but with the discovery of certain exact arithmetical relations among the various functions of turnouts and crossovers, and with the design of some empirical rules for the dimensions that do not require fine exactness, the field becomes open to all intelligent track men. The data herein assembled are offered therefore as a guide to all railroad builders and maintainers.

It is presumed that the terms commonly employed for the various functions of switch connections are entirely familiar, but in order that there may be no misunderstanding of them, their interpretation as used is clearly indicated in the diagram. It must be understood that the detailed design of switch and frog members, which varies somewhat with different roads, materially affects certain functions, and that it is therefore impossible to design rules which will apply absolutely to such cases. But it will be found that for even the extremes of design a generic relation obtains which only requires that proper constants be selected. The lead and degree of curve are the dimensions most affected by the choice of switch length and by design of the frog, but experience has shown that a slight variation in the length of the lead causes no defect in the finished work and the degree of curve is only of incidental concern.

Theoretical leads are never employed in railroad switch work. The nearest approach to such use is in the very sharp turnouts below No. 4, wherein it is the practice to curve the turnout rail, but as the straight switch still is used the problem remains one of practical design. A rigid construction of Section 2 of the Safety Appliance Act virtually requires discontinuing the placing of connections below No. 5, and interest in them is only one of present maintenance and judicious elimination as opportunity arises. The problem of lining the turnout curve at the heel of the frog is the only practical use for the theoretical formula for lead and this use is only an indirect application of the geometrical principle.

The distances between frogs, both in crossovers and ladders, follow geometrical lines and rules, for their computation should be exact, and care should be taken when applying the frogs to use the exact dimensions. This is especially true of crossovers, for even though laid on precise lines the dimension will be found after a time to vary as much as 2 in. through the creeping of rails. This fact alone condemns the use of a formula that is often employed in computing published tables, which gives results that are too long for all crossovers, but particularly for the lower numbers of frogs. As most non-interlocked crossovers are trailing the error thus introduced is increased by the running of the rails, the consequent tightening of the gage being very unfavorable.

It is unquestionably a duty to follow standard dimensions whenever possible, with the single exception that the lead may be varied somewhat, which indeed local conditions will often necessitate. The two dimensions especially which admit of no variation are the heel gage of the switch and the guard rail gage. Adherence to the former avoids fatiguing stresses in the switch rail and any deviation from the latter invites accident.

RULES FOR COMPUTING CERTAIN DIMENSIONS

The lead is the principal dimension of the turnout. It is the distance between the actual point of switch and the ½-in. point of the frog, measured along the main rail. *The proper lead is that one which makes the tangents through the switch and the frog meet at a point midway between them.* This not only provides regular curvative, but the lowest degree of curvative that is possible for the connection. The function of the lead is therefore dependent not only upon the number of the frog, but upon the length of switch used and also upon the toe length of frog. Some turnouts are equally satisfactory with different lengths of switch, provided in each case the proper lead is used. Thus, a No. 6 turnout may have any length of switch between 10 ft. and 18 ft. and a No. 12 any length between 18 ft. and 30 ft. It is generally considered, however, that the selection which renders the ratio of switch angle to frog angle about as 1 to 4 is the most satisfactory. This in effect signifies that with 5¾ in. heel gage the length of switch should be twice the number of the frog.

The frog length in the lead being generally the same for all turnouts in the same class, the variable part of the lead will be the length of the rail between the frog and switch. This may be expressed in multiples of the frog number with sufficient accuracy for general use.

The empirical rule given below will be found quite in accord with accepted standards when a toe length between 6 ft. and 7 ft. obtains. If a shorter toe length is the rule the constants may readily be redesigned to furnish exact agreement with the leads that are proper for such reduced toe length. In fact, when this means of expressing the function of the lead is adopted as a memory aid, which is its main purpose, the constants should be first adapted to the practice that obtains on the particular road.

The length of the rail in the lead is 5 times the number of the frog for a 10 ft. switch, 5½ times for an 18 ft. switch and 6 times for a 30 ft. switch.

It is only necessary to add the switch length and the toe length of frog to the figures thus computed to obtain the practical lead. The leads that would obtain with the standard material of one road, as well as some adopted standard leads of that road, are given in the table below. The average ratio of switch angle to frog angle employed is 1 to 4½.

Such a rule is not only useful as a memory aid, but it furnishes the means of readily obtaining the proper lead in the event that a frog of special number, for which no standard lead is announced, is employed.

*Copyrighted by W. F. Rench, June 19, 1914.

TABLE 1

Switch	Frog No.	Solution	Lead	Standard lead
10 ft.	5¾	5¾ × 5 + 10 + 7 ft.	43 ft. 3 in.	41 ft. 10 in.
10 ft.	6	6 × 5 + 10 + 7 ft.	47 ft.	46 ft. 10 in.
18 ft.	6	6 × 5½ + 18 + 7 ft.	58 ft.	.....
18 ft.	8	8 × 5½ + 18 + 7 ft.	69 ft.	69 ft. 11 in.
18 ft.	10	10 × 5½ + 18 + 7 ft.	80 ft.	81 ft. 7 in.
18 ft.	12	12 × 5¾ + 18 + 7 ft.	91 ft.	.....
30 ft.	12	12 × 6 + 30 + 7 ft.	109 ft.	.....
30 ft.	15	15 × 6 + 30 + 6 ft.	126 ft.	130 ft. 00 in.
30 ft.	20	20 × 6 + 30 + 7 ft. 10 in.	157 ft. 10 in.	156 ft. 00 in.

THE DEGREE OF CURVE

For the purpose of the supervisor and the foreman the degree of curve may be defined as the number of inches the rail deflects from the middle of a string 61 ft. 4 in. in length held to contact at its two ends, fractions of the inch being multiplied by 60 to supply the minutes of arc. The degree of curve of a turnout does not figure in any way in its installation and is only of consequence in determining the class of power which may be permitted to operate through it or the limit of speed to be prescribed or the templates to use in plotting a switch layout. The motive power experts do not assume to fix the limit of practical operation nearer than 100 per cent above the curvature that may be just passed and it is recognized that enginemen cannot regulate speed closer than 10 per cent, and for plotting the last margin is also ample. An empirical rule, therefore, which enables the investigator to approximate the curvature within 10 per cent will satisfy all practical requirements.

It is, of course, recognized that the degree of curve of a properly designed turnout depends both upon the length of switch rail and the toe length of frog. The shorter these two members are the more nearly does the curve approach the theoretical degree, which is, of course, the minimum. But the heel gage admits of little variation from 5¾ in., which provides a 3½-in. flangeway, and a reduction in the length of the switch rail only increases the abruptness with which the turnout deflects from the main track.

It is recognized that a 10 ft. length of switch point is the minimum for the best service. Similarly the toe length of frog for modern hand-center construction can hardly be less than 5 ft. for any frog and for No. 8 and No. 10 frogs must be no less than 5 ft. 6 in. and 6 ft., respectively, to avoid the use of filler blocks for the joints. It may, therefore, be considered that the combinations shown in the table represent good practice and it is upon those dimensions that the approximate degrees of curvature as given below are laid.

It will be found, however, that the ratio of curvature for different frog numbers will hold with no more than 10 per cent. error for the specific designs in use on any particular road and the value for the basic turnout being determined the values for the others will follow a natural order. Thus, the road that prefers short switch points and frogs might have a value as low as 19 deg. 36 min. for the curve of a No. 6 turnout, which would require the use of 8 ft. point rails and 4 ft. 6 in. toe length of frog. If turnouts of other numbers followed the same general type, the ratio would produce the degree of curvature for all cases.

The radius of a No. 6 connection from tangent track is 250 ft. The radius of a No. 8 is twice this, of a No. 10 three times, of a No. 12 five times, of a No. 15 seven times, and of a No. 20 fourteen times. The degree of curve of a No. 6 is 23 deg., and the degree of curve of the other turnouts mentioned varies inversely in the above ratio.

To determine the degree of curve of turnouts from curved track it is only necessary to add the degree of the main track curve for turnouts from the inside and to subtract it for turnouts from the outside, and if the radius is desired to divide 5,730 by the resulting degree.

THE DISTANCE BETWEEN ½ IN. POINTS IN CROSSOVERS

An exact rule for calculating the distance between ½ in. points in a crososver measured along the main track is as follows:

Subtract twice the gage from the track centers, multiply by the number of the frog, subtract inches equal to the number of the frog and further subtract the quotient obtained in dividing the track centers by four times the frog number.

Thus this dimension for No. 6 crossover with 13 ft. centers is obtained as follows: 13 ft. 0 in. — 2 (4 ft. 8½ in.) = 3 ft. 7 in. $\times$ 6 = 21 ft. 6 in. — 6 in. — $\frac{13 \text{ ft. } 0 \text{ in.}}{4 \times 6}$ = 20 ft. 5½ in.; and for a No. 8 crossover with 12 ft. 2 in. centers as follows: 12 ft. 2 in. — 2 (4 ft. 8½ in.) = 2 ft. 9 in. $\times$ 8 = 22 ft. 0 in. — 8 in. — 12 ft. 2 in. $\div$ 4 $\times$ 8 = 20 ft. 11½ in.

This rule is especially useful where a crossover is to be installed between tracks that have a different intertrack distance than the standard or where frogs of different numbers are to be combined in the same crossover. In the latter case the multiplier is the mean of the two frog numbers and the subtrahend and item in the divisor the same mean figure.

It is mistakenly thought by some that a different distance between ½ in. points should be used when the crossover is on a curve; but all linear dimensions for such a case remain the same. The effect is merely to introduce between the frogs a curve similar to the main track curve and turning in the same direction in place of the usual tangent track.

THE FROG ANGLE AND THE SWITCH ANGLE

It is not infrequently necessary to know the exact frog and switch angles, especially for the purpose of computing the precise degree of curve of the turnout. The solution that supplies the degree of curve for turnouts from straight track is to subtract the switch angle from the frog angle and divide the remainder by the length of curve between the switch and frog.

One of the necessary dimensions to be remembered in all railroad engineering is the length of radius of a 1 deg. curve. This, as is well known is, 5,730 ft. It happens that this dimension expressed in chain lengths, or what is equivalent, divided

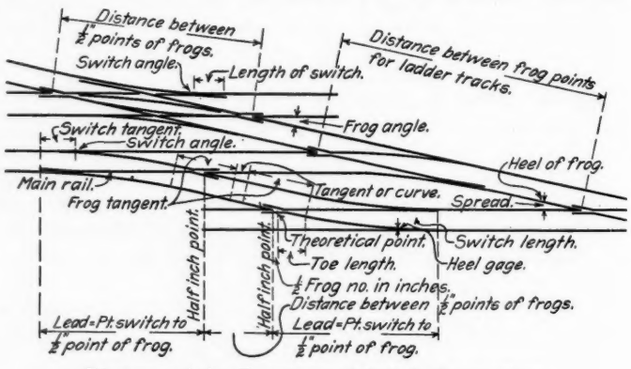

Diagram of the Functions of Switch Connections

by 100, supplies the constant necessary to obtain the frog angle, which is found by dividing the constant by the frog number. The results by this rule are practically exact for frogs above No. 6, and nearly so for frogs of No. 6 and lower.

If the difference between the thickness of the switch point, which is usually ⅛ in., and the heel gage were just 6 in., the same constant divided by twice the length of switch would equal the switch angle. It is, however, only necessary to compute a new constant which will be to 57.30 as 6 is to the actual difference. This is 5⅝ with a 5¾ in. heel gage, the constant for which is found to be 53.70. This figure divided by twice the length of switch will give the switch angle within a few seconds.

THE DISTANCE BETWEEN FROGS IN LADDERS

The problem of obtaining the distance between frog points for ladder tracks measured along the ladder involves tedious

computation by tables that the following simple rule which is exact will avoid:

Multiply the track centers by the number of the frog and add the quotient obtained in dividing the track centers by four times the frog number.

Thus this dimension for a No. 10 frog and 15 ft. 0 in. track centers is obtained as follows: $15 \text{ ft.} \times 10 + \frac{15 \text{ ft. } 0 \text{ in.}}{4 \times 10} = 150$ ft. 4½ in.; and for No. 8 frog and 13 ft. 0 in. centers as follows: $13 \text{ ft. } 0 \text{ in.} \times 8 + \frac{13 \text{ ft. } 0 \text{ in.}}{4 \times 8} = 104 \text{ ft. } 5 \text{ in.}$

The above method is correct whether the ladder is straight or curved. A curved ladder is always proper when the main tracks are on a curve and the degree and direction of curvature of the ladder are exactly the same as those of the tracks with which the ladder conects. A very common error is to endeavor to introduce a straight ladder for a system of curved tracks. If the degree of curve is small the result may not be bad for the first few frogs, but the error grows as tracks are added and soon requires that another number of frogs be used and may necessitate the employment of special frogs. It is certain to furnish very imperfect general results.

When designing a ladder for curved tracks, due consideration must be given the fact that the curvature, whether the turnout be from one side or the other of the main track curve, is no greater than the difference between the normal degree for the selected number of frog and the degree of the main track curve. The advantage in recovery that obtains in the case of a simple turnout from curved track to a parallel siding does not obtain in a ladder. The computed dimensions for ladders furnish a ready means of alining them and are of equal application whether the ladder connects with tangent or curved tracks.

THE DISTANCE BETWEEN ½ IN. FROG POINTS IN SLIP LADDERS

It is not so important to remember the dimensions which apply in slip ladders, as excepting the distance between the ½ in. points of frogs, the dimensions are largely dependent upon details of design, such as, the length of the switch and the heel gage, and the standard plan must necessarily be consulted. It is well, however, to know the following exact rule for obtaining the distance between ½ in. points measured along the ladder which follows the same geometrical solution as in a plain ladder, the difference being that the corrections for ½ in. points do not negative each other, but are additive and twice the gage replaces the track centers in the principal function and the further correction applies only to the gage distance for the ladder track. The distance between the ½ in. points of frogs in the extension of the ladder to adjoining tracks would be obtained by the rule for simple crossovers.

Multiply twice the gage by the frog number and add inches equal to the number of the frog and further add the quotient obtained in dividing the gage by four times the number of the frog.

Thus, this dimension for a No. 6 slip ladder, with 4 ft. 9 in. gage, is obtained as follows: $2 \text{ (4 ft. 9 in.)} \times 6 + 6 \text{ in.} + \frac{4 \text{ ft. } 9 \text{ in.}}{4 \times 6} = 57 \text{ ft. } 8\frac{3}{8} \text{ in.}$; and for a No. 15 slip ladder, with 4 ft. 8½ in. gage, as follows: $2 \text{ (4 ft. } 8\frac{1}{2} \text{ in.)} \times 15 + 15 \text{ in.} + \frac{4 \text{ ft. } 8\frac{1}{2} \text{ in.}}{4 \times 15} = 142 \text{ ft. } 7 \text{ in.}$

RULES FOR LINING THE CURVES OF TURNOUTS

The curves of the turnout should always be established by the use of the string. It has been found that for all turnouts from straight track no matter what the frog number if the adopted practical leads are used the middle ordinate of a string drawn between the heel of the switch and the toe of the frog is 6 in., and the ordinates at the quarter points of the string are each 4½ in. and for turnouts from the inside of a curve the middle ordinate is 6 in. plus the ordinate of the main track obtained with the same length of string as used for the turnout and for turnouts from the outside is 6 in. minus such ordinate, the quarter ordinates in both cases being computed as three-fourths the resulting middle ordinate.

If the turnout is a very long one it is sometimes useful after fixing the position of the rail at the middle and quarters to draw the string to a contact at the middle point when by the principle that ordinates vary approximately as the square of the chords the new ordinates at the original quarter points will be found to be one-fourth the original middle ordinate and additional points may be established at the quarters in each half by ordinates which are computed as three-fourths of the middle ordinate from the half string.

The matter of lining the curve at the heel of the frog is almost invariably left to the eye of the foreman with the result that this part of the turnout is usually the most irregular and the one incidentally where the greatest number of derailments occurs, especially in the sharper turnouts. When the curve at the heel is continuous with the curve of the lead, the line is sometimes established with the instrument at the time the layout is made; or else the curve may be exactly alined by a proper use of the method of ordinates. But for turnouts which reverse into a parallel track a rule can be stated that will apply to all cases and will furnish a direct method of establishing at once both a regular curve and the one of largest radius possible for the connection.

There is a mistaken impression, and it is even stated as a rule for guidance in a book on switch work which has considerable use, that in such lining the frog tangent should be extended to the same length as that obtaining in a crossover. This is wrong because the shorter the tangent of the curve the greater the degree of curvature. The tangent should, therefore, be as long as possible, which requires that the P. C. be established at the heel of the frog. This is especially important where the turnout is from the outside of the curve. In such a case it may be essential to use this advantage with the alternative circumstance that the turnout may enter a different class for operation. Thus, if a No. 6 connection is limiting for road power, such a connection from the outside of a 5 deg. curve with the point of curve at the heel of the frog would just remain within the limit. Alined in the manner of a crossover, the curvature would become 28 deg., or 207 ft. radius, and the connection be open only to switch engines.

The suggested practice adds to the operating efficiency of the turnout without appreciable sacrifice of standing room on the siding and is a maintenance advantage as well, because that part of the turnout, not being secured, as is the lead portion, is subject to traffic shifting and requires a greater initial radius to remain with even moderate supervision within the required degree of curvature. This proposition being accepted, the rule for lining may be stated, which follows a similar geometrical solution to that for theoretical lead, except that the item of gage is replaced by the off-set from the heel of the frog on the turnout rail to the line of the near rail of the parallel track. By a similar computation any other point on the frog tangent can be used if desired.

From the distance between gage lines of the parallel tracks subtract the spread at the heel of the frog and multiply by twice the number of the frog, which gives the distance to be measured along the main track from the heel of the frog to the point at right angles with the end of the curve, whether the turnout be from straight or curved track. For turnouts from straight track measure from the middle of a string drawn between this point and the heel of the frog an ordinate of 20 in., and from the quarter points ordinate of 15 in., which will give three essential points in the curve. The turnouts from curved track the middle ordinate must be increased by the amount of the ordinate of the main track curve, obtained with the same length of string, for turnouts from the outside and sim-

ilarly decreased for turnouts from the inside of the main track curve and the quarter ordinates computed as three-fourths the resulting middle ordinates. Thus for the No. 10 connection with a siding on the outside of a 4 deg. curve on 12 ft. 2 in. centers with the main track the distance to be measured from the heel of the frog to the end of the curve would be obtained as follows: 7 ft. 5½ in. — 10 in. = 6 ft. 7½ in. × 20 = 132 ft. 6 in. The middle ordinate of a 4 deg. curve being 18 in., the ordinate to be measured at the middle in lining the curve at the heel is 20 in. + 18 in. or 38 in., and at the quarters, three-fourths of 38 in. or 28½ in.

HINTS REGARDING LAYOUT

A specific arrangement, which by a proper selection of location may often be made to apply for such important points as the end of double track, or the ends of passing sidings, is the establishment of the frog of the turnout just as the beginning of a curve, when there will be continuous simple curvature for both sides of the connection and the superelevation will be common to both tracks. This is of very great advantage to the operating efficiency of the turnout.

In congested districts it is not always possible to employ a simple ladder and resort may be necessary to lap connections. This should never be three-throw switch work, which is in the nature of special design requiring interest charges for infrequently used duplicates. Lap connections can always be designed which will employ regular stock patterns of frog and switch material.

It is often advantageous, particularly when the crossover is on a curve or partly on a tangent, to plan the crossover with dissimilar frogs. If, for example, the available space on a 3 deg. 30 min. curve will permit of no longer crossover than a No. 10, a better alinement will be obtained by the use of a No. 8 turnout from the outside and a No. 12 turnout from the inside of the curve, the resultant curvature being 8 deg. for both ends, whereas one end of the No. 10 crossover would have been 11 deg. This plan eliminates the tangent between the frogs, but for low speed movement this is not important. The arrangement, however, has limitations, as it is not possible in ordinary track centers to mate any frog with one that has a number more than 60 per cent. greater; that is, a No. 8 and a No. 12, a No. 10 and a No. 15, a No. 15 and a No. 20, or a No. 15 and a No. 24 are limiting combinations.

It sometimes becomes necessary to modify the curvature not only on account of the general objection to its sharpness, but because of the resultant clearance with adjacent tracks. Thus, a No. 6 connection in tangent track adjoining a main track with 12 ft. centers is hardly a safe selection. The "nosing" of the longest passenger equipment while passing through such turnouts furnishes bare clearance with the traffic running on the adjacent track, and if curvature and superelevation enter there may be actual interference.

It is usually considered objectionable to locate crossovers on a curve, but there are advantages which weigh well with the disadvantages. Thus, a No. 20 crossover on a 1 deg. 40 min. curve is a 3 deg. 20 min. curve on one end and tangent on the other. Although the curvature is twice as sharp as for a No. 20 from straight track, there is the compensating feature of the superelevation of the main track curve, which being designed for high speed on the main track is ample for the reduced speed through the sharper curve of the turnout.

A RULE FOR DESIGNING THE BILL OF TIMBER

It is very necessary that the supervisor shall be able to instruct his foremen how to design and apply a set of switch ties, especially for new work, so that when the switch work is completed the timbers will line up on both sides accurately. The average foreman will err on the side of excess, probably with the thought that timbers can be cut off but never pieced out. This results in measurable loss, both for the timber wasted and for the labor necessary to correct the error.

The published bill of material for various turnouts and crossovers, which is practicable enough for purchasing department purposes, supplies no guide either in selecting or applying the ties. Even if by clever interpolations a working bill is deduced from the general bill it does not furnish any check upon its installation.

The rule for lining the curves of turnouts furnishes a practical means of calculating the lengths of the timbers for the middle and quarter points, and these are found to be practically the same for all turnouts and are respectively 10 ft. 4 in., 9 ft. 5 in. and 11 ft. 5 in. The timber at the heel of the switch is always 9 ft. 0 in., but that at the toe of the frog varies according to the spread of the frog. It is 12 ft. 9 in. for No. 24, No. 20 and No. 15 frogs, 12 ft. 8 in. for a No. 10 frog, 12 ft. 5 in. for a No. 8 frog and 12 ft. 2 in. for a No. 6 frog. It is, of course, well known that the timber at the point of frog of all turnouts is 13 ft. 3 in.

There is now at hand a practical check upon the bill to be designed, as well as upon the correctness of the installation. This bill may be obtained off-hand by the following simple rule, which is fairly accurate for all turnouts, either from straight or curved track. Determine first what number of ties will be required between the switch and the frog and divide this number by 3. Calculate the increase at the frog by dividing 23 in. (or any other spacing center to center of ties that may be preferred) by the number of the frog. Beginning with 9 ft. 0 in. set down lengths for the first third by adding successively one-third the increase at the frog and for the second third by adding two-thirds of the increase at the frog, and for the last third by adding the full increase at the frog.

It will be found that the last tie in the last third approximates the length computed for the toe of the frog and that the ties at the middle and quarters are practically the same lengths as was computed for those points.

To illustrate: the number of ties between the switch and frog of a No. 15 turnout is 48. The increase at the frog is 1½ in. The respective increments are, therefore, 1½ in. for the first 16 ties, 1 in. for the second 16 ties and 1½ in. for the last 16 ties. It will be instructive to write down the full bill and note that the 12th tie is 9 ft. 5 in., the 25th tie 10 ft. 4 in., the 37th tie 11 ft. 6 in., and the 48th tie 12 ft. 10 in.

If the turnout leads to a parallel track the timbers through the frog and beyond increase to the last at the uniform rate computed. If the turnout continues to curve away from the main track the timbers beyond the frog must be correspondingly lengthened.

When renewal of an existing turnout is to be made it is a very simple procedure to measure the distance gage to gage of outer rails over each tie, provided they are properly spaced, and if not, then at the point where with proper spacing ties would occur, and add to the figures thus obtained the constant 3 ft. 10 in. which gives the proper lengths of ties to be used.

THE GRAPHICAL METHOD OF ESTABLISHING A LAYOUT

It is practically impossible to establish a complicated layout of switches upon the ground with the transit instrument and whenever such a feat is attempted nice work is required on the part of the foreman to harmonize the arrangement. A much more satisfactory solution of the problem is found in the graphical method. With good templets a layout may be plotted exactly to scale, and if the scale is large enough (but not so large that the radius of the curves overruns the available scope of the curve templets) scale measurements may be taken at intervals across the layout and from these and the linear measurements for the practical lead a fairly correct location can be made. Even when turnouts as high as No. 20 are employed it is possible to use a scale as great as 1 in. to 16 ft, but in most cases, if the plotting is exceedingly accurate, a scale of 1 in. to 32 ft. is sufficient. The architect's scale is preferable to the engineer's scale for this purpose, as dimensions for switch connections are generally and should always be in feet and inches rather than tenths, especially because the men who apply the switch material know only the rule of inches.

In installing switch work the importance of obtaining a correct alinement for the main track before the turnout is lined is patent to everybody, and for this purpose a working knowledge of the method of lining curves by the string (which was elaborated in the *Railway Age Gazette* of May 15, 1914,) is quite essential. The scale dimensions fix the location of the tracks within a very few inches and painstaking work with the string readily corrects minor defects.

Not the least of the purposes it is hoped these practical hints and rules may serve is to fortify the unsuspecting against error through the use of published tables of leads, distance between frog points, lengths of crossovers, etc. These tables are not infrequently theoretical functions, which fact is not always stated, and the figures are often entirely out of keeping with standard practice. Rules are made use of which may obtain for certain number of frogs, but are seriously at fault for other numbers. The authority for any such tables should be known before their use is accepted. With the equipment these rules supply, tables for ordinary switch connections may be entirely dispensed with.

DISCIPLINE IN THE MAINTENANCE OF WAY DEPARTMENT

By J. T. Bowser

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On the majority of railroads the lines along which discipline is administered among train and enginemen are more or less clearly defined by the contracts with the various brotherhoods, but this does not appear to be the case generally with maintenance of way department employees. The character of the discipline in this department and the methods by which it is administered differ widely on various roads and under various officials. It is of course recognized that the handling of the common labor or of employees of a lower rank than foremen must be left entirely to the foremen, but the growing scarcity of track and bridge and building foremen will warrant a careful, systematic handling of cases where, in the interest of good service, discipline must be administered to them.

There is some difference of opinion among maintenance officers as to the relative value of suspension, as compared with a system of properly recorded reprimands, as a means to insure the proper performance of duties and the observance of rules. There is a great deal to be said for each, and it is quite probable that the best method is a combination of both. In either case, or in cases where no regular system is followed, it is certain that a personal record of foremen is of considerable value in handling men. This record should be based on regular application papers, which should show the previous service of the foreman, both as a track laborer and as a foreman as well as in any other capacity he may have worked and which may have any bearing on his ability. These papers should be filled out when the foreman is promoted or employed. On this record should be posted all information which would be of value in determining the desirability of the services of each man as a foreman.

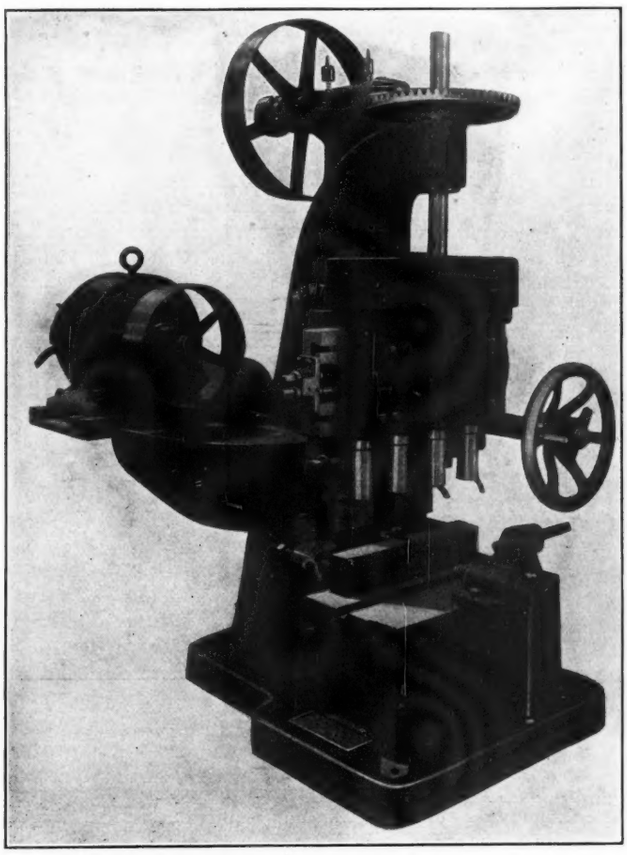
For various minor offenses, it is probable that a reprimand administered by the roadmaster or supervisor, with the understanding that it is to be posted against the foreman's record, will be more effective than a suspension. In the first place, there will be no loss of efficiency of the gang, due to the change in foremen for a short time. Also the foreman is less likely to resent the reprimand and become sullen, while his pride in his record will probably act as strongly as a deterrent, as would the pecuniary loss due to a suspension. For more serious offenses both a suspension and a reprimand would probably be necessary, but it should be borne in mind that the company will, in the majority of cases of suspension, lose more than the foreman, from the loss in efficiency of the gang on account of the change of foremen.

Before administering discipline of any nature, the previous record should be consulted, as this should have a great deal to do with the severity of the sentence. Where the record of reprimands and suspension previously administered indicate that the man is not making a desirable foreman, he should be removed from the service. If the discharge is based more on the general record than on any particular offense, the man should be reduced to a laborer and retained in the service if he cares to stay, as it is quite possible that if given another chance at some later time, he may make good. While it is certainly not best for roadmasters or division engineers to take from the road supervisors their disciplinary powers, still those officials should exercise a general supervision over all cases so as to see that no injustice is done.

Commendation for unusual services, such as the prevention of accidents, taking the premium in an annual inspection, suggestions of value to the safety committee or for the general good of the service, etc., should also be recorded and should have weight when the general record is considered. When it is generally understood among the foremen that a record of their services is being kept, that all offenses and discipline, as well as commendations for unusual services, are entered against this record, and that this record is used to determine, not only the severity of discipline in any case which may come up against them, but also their desirability as employees, this record will have become a powerful force for general efficiency.

A NEW RAIL DRILLING MACHINE

The rail drilling machine shown in the illustration drills the three holes for the fish-plate bolts and the hole for the rail



A New Machine for Drilling Holes in Rails for Fish Plate Bolts and Rail Bond

bond at the same time. The three right-hand spindles for the bolt holes are arranged so that the distance between centers of the holes can be adjusted from 3½ to 9 in. The left-hand

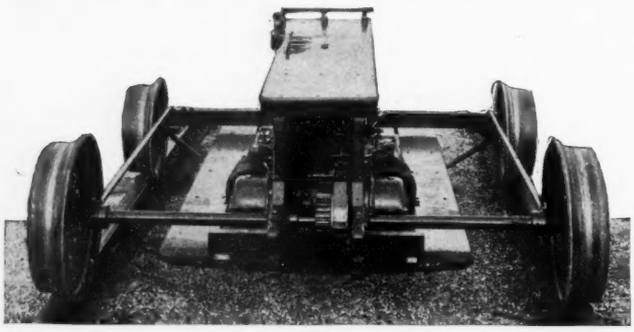
spindle for the rail-bond hole is kept a constant distance of 6 in. from the last bolt hole.

All the spindles are mounted on a saddle and can be moved vertically in unison. The saddle is counterweighted and has two changes of power feed in addition to hand adjustment. The machine is made by the Newton Machine Tool Works, Philadelphia. A 10 h. p. Westinghouse electric direct current motor furnishes the power.

NEW MUDGE MOTOR CARS

A new car, class "GI," known as the "mountain climber," has recently been placed on the market by Mudge & Company, Chicago. In its construction the same frame is used as on the company's standard design four h. p. car, class "EI," the double lower frame rail being a patented feature and standard on all of the inspection cars of this make.

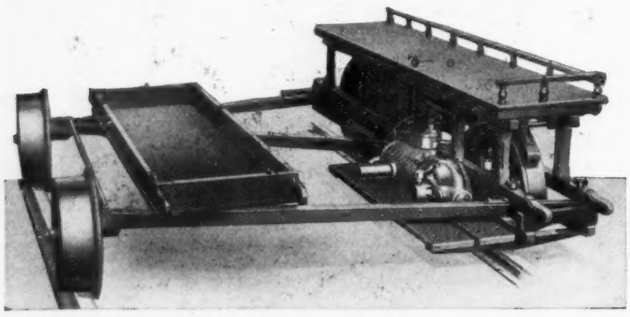
The motor is of the direct connected type with a 5½-in. stroke



New Inspection Car for Heavy Grades and Strong Head Winds

and 4½-in. bore. Young white ash is used in the frame and cross arms, the latter being steel bound. A railing extends the entire length of the seat board and a long tool tray is part of the equipment. This car is intended for parts of the country where heavy grades and strong head winds are encountered and is light enough so that one man can easily handle it under all kinds of conditions.

Another new car is the "Safety First," class "EESF." This car carries the same twin power plant as the eight h. p. "EEI," and is said to negotiate very stiff grades under heavy loads.



New Inspection Party Motor Car

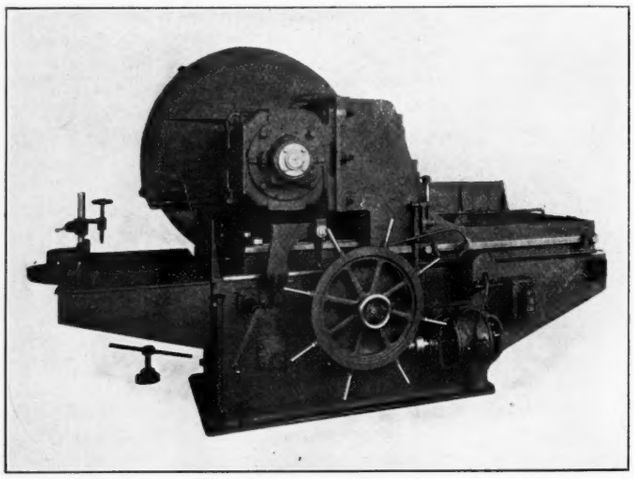
The engines on this car are controlled by two separate sets of levers and when full power is not required it is necessary to operate but one motor.

The longitudinal seat is placed midway between the four wheels, running the entire length of the car. Long foot boards are placed on each side to enable passengers to alight quickly from the car in either direction. The frame is decidedly underslung with the weight so balanced as to make the car stick to the track.

HIGH SPEED FRICTION SAW FOR MANGANESE RAIL CUTTING

A new high speed friction saw has recently been designed by Jos. T. Ryerson & Sons, Chicago, which is particularly adapted to cutting manganese and high carbon steel rails and shapes. A number of these machines which have been installed in railroad and private frog and switch shops have demonstrated their ability to cut such steel, their economy in operation and their adaptability to various classes of shop work. In one such shop, a high speed friction saw displaced five cold saws, increasing the capacity of the shop, decreasing the number of men in the saw gang, decreasing the cost of cutting without increasing the power consumption and saving over $1,000 the first year on cold saw blades and their maintenance, and averaging 350 cuts per day. It was found that manganese steel rails could be cut more readily than high carbon rails, which in itself was a great saving, as it had previously been necessary to do this work with an oxy-acetylene flame.

The new saw which is known as No. 3 consists of a very heavy cast iron box base on top of which is mounted a horizontal sliding motor table, with a vertical extension which is used as a motor bracket, giving the motor what is commonly known as a



The Ryerson No. 3 High Speed Friction Saw

wall mounting. The table operates horizontally on vertical rollers and horizontal rollers are also provided to prevent the sidewise motion of the table. The work or cutting table is separate from the base so that it may be adjusted vertically by means of a screw and crank so that rails which are only to be cut part way through can be handled to advantage. The table is fed to the work horizontally, while in older designs of friction saws the work has usually been fed to the saw. The machine can be fitted with four types of feed, namely, hand wheel, hydraulic, pneumatic or electric. The electric feed consists of an individual motor with adjustable limit stop to control the movement of the table. The forward feed varies automatically between 10 in. per min. and 42 in. per min., and by means of a special patented arrangement, the same motor is made to drive the table in its reverse movement at a speed at least ten times the forward speed. The material to be cut does not require holding in a vise, eliminating all adjustment for cutting various sizes and shapes. A standard rail, girder rail, beam, angle, channel, etc., may be cut in immediate succession without any changes. When miter or bevel cutting is being done the material is clamped. The beveling attachment allows the work to be set for any bevel up to 45 degrees.

The cutting blade is made of a special grade of soft steel which greatly reduces the first cost over the special tool steel blade used in slow saws. It is balanced, hollow ground and nicked

on the edge to increase the friction and allow clearance when passing through the material. It is suspended from the extended shaft of the motor and housed in a cast iron hood bolted to the sliding table to prevent injury to the workmen and to concentrate the sparks. The mounting of the blade directly on the armature shaft is an improvement over the belted saw as it eliminates entirely the slip of the belt. The blade is held in place on the shaft by steel flanges and nuts. One end of the shaft is provided with an adjusting device for taking up the float of the armature or roller, as this must be entirely eliminated to insure straight cutting. Within the hood there is a perforated pipe extending around the inside periphery for the water supply which is necessary to keep the blade cool and to quench the sparks.

The cutting blade has a diameter of 52 in. and is ⅜ in. thick. When the nicks in the edge are filled up in the course of the work, they can be renicked by an ordinary laborer, an important item in the maintenance of the machine as it eliminates the expensive grinding of old blades. The blades require renicking after from five to ten hours of continuous cutting. In one large shop it has been found advantageous to change the blades at noon and night, eliminating all delays for removing dull blades. The life of the blades has been found to average two to three months in continuous hard service.

The motor is of special design for heavy mill duty, having a nominal rating of 45 h. p. and a speed of 1,800 r. p. m. It is designed to stand excessive overload without severe heating. The saw end of the motor is entirely enclosed and the opposite end is semi-enclosed with cast grids or wire mesh. If the saw is operated by alternating current the ordinary type of compensator is furnished, or if direct current is used, a hand operated starting rheostat or an automatic starter with push button control can be provided, the latter being the most satisfactory.

The saw occupies a floor space 5 ft. 8 in. by 10 ft. 9½ in. and has an overall height of 6 ft. 10⅝ in. It can cut flat plates up to a maximum width of 24 in., 100 lb. T-rails, or 9 in. girder rails and I-beams or structural shapes up to 24 in. in depth.

The machine itself is operated by one man, the amount of labor required to move the material to and from the saw depending, of course, on the mechanical facilities which the local shops afford. The rate of cutting depends principally upon these facilities for bringing the work to the machine. The saw will cut a 100 lb. rail in 45 seconds easily and by crowding this time can be reduced, although in practice it has been found that 40 seconds is about the minimum time that should be allowed for cutting a standard rail section. Numerous tests have shown that in cutting 85 lb. rails the power consumption averages about 0.25 kilowatt hour per cut. When the saw is not cutting, the motor is, of course, running free.

EQUIPMENT FOR AND OPERATION OF WORK TRAINS*

BY J. W. POWERS

Supervisor of Track, New York Central & Hudson River, Oswego, N. Y.

The proper equipment of a work train depends to a large extent upon the nature and magnitude of the work to be performed. But in order to secure the maximum efficiency, such trains should be equipped with proper devices and labor saving appliances to reduce to a minimum the amount of manual labor. The most important among the devices which have been perfected are steam shovels, steam cranes, ditching and rail loading machines, pile drivers, levelers, unloading plows, ballast spreaders and specially designed cars for ballasting and grading. Another important matter which is sometimes overlooked in the equipment of work trains is that of furnishing the men with a suitable car to ride in so that they will not be so liable to injury.

It is possible that certain work for which work trains are employed might be done more economically by other means. This refers principally to grading and ditching. It is contrary to the rules on some roads to use work trains to distribute material or do other work that can be handled by regular way or through freight service, but observation leads to the conclusion that there are some cases where it is more economical to have the work done by work trains even though it can be done by regular freights.

It is sometimes advisable to employ two or more work trains to increase the efficiency of steam shovels. The work of doing light grading by hand adjacent to side tracks may sometimes be accomplished with good results by using work trains on alternate days, the cars being placed one day, loaded the next and on the following day unloaded and placed as before. In this manner the expense is greatly reduced.

The foreman or conductor of a work train to be successful should be a man of intelligence and it is essential that he should have a thorough training and extended experience. He should be capable of formulating plans, studying and improving each moment and should realize the value of time as the progress of all work train service depends upon the proper utilization of time. The man in charge whether foreman or conductor is the man who can and should increase the efficiency of a work train.

Many roads require a conductor who is a practical trackman and is capable to act as both foreman and conductor. A man who is possessed of these qualifications is hard to find, and as a conductor must accompany his train when it gets in the clear if he is also the foreman he must leave several men in charge of an assistant who is sometimes incapable of doing the work in which they are engaged. A better method would be to place a competent foreman as well as a conductor with the train.

In order to obtain the best results it is necessary for the foreman and conductor to work in harmony. They should plan their work so as to cause the least delay to their own and other trains. When a delay occurs the foreman should profitably employ the time of his men. He should always see that his men are so arranged as to work to the best advantage. He should see that rails, ties, etc., are not unloaded while the train is in motion or thrown into ditches or so placed that they will roll down embankments. He should exercise great care when unloading frogs and switches to see that they are not bent or broken. When unloading and distributing ballast it should be done as evenly as possible except at high places where little or no ballast may be required or at low places or weak shoulders when it may be necessary to double. When unloading and distributing material the foreman should be governed by the idea of assisting the section forces as much as possible.

The nature of some work, such as hauling and distributing ballast, requires a heavy engine in good condition, while such work as loading and unloading rail, distributing ties, etc., could be done as satisfactorily with a light engine. As the distribution of motive power lies with the operating department it is not an unusual occurrence, when a work train is ordered, to have the poorest power available furnished in order to retain the best power to handle regular trains. This is false economy as the proper execution of some work makes it imperative that the best and heaviest engine in the service be procured.

It is sometimes advisable to tie up work trains at night as near as possible to where the work is being done even though it is necessary to employ a watchman, as this is cheaper than to pay train crews overtime for going to a point where regular watchmen are employed.

A report should be sent in daily by the conductor to the supervisor, showing the nature, location and amount of work done, the time of arriving and leaving each station, all delays and their causes. Any defects to the equipment should be promptly reported and effective remedies applied. With this report at hand the supervisor can readily determine how the work is progressing. In connection with this the despatcher should be notified each night where the train is to work the following day and if a change in crews is to take place, the despatcher should so notify the supervisor in order that proper instructions be given

*Received in the contest on The Proper Handling of Work Trains which closed December 27, 1913.

the new conductor so that there will be no confusion or delays.

The supervisor or roadmaster should be with a work train as much as possible and see that proper tools and materials are provided and kept in the best possible condition. He should see that a sufficient force of laborers is placed on the train, but that the number does not exceed that which can be worked to good advantage. He should endeavor to point out to the foreman and conductor the necessity of avoiding unnecessary delays and wasted efforts.

EXPERIMENTS WITH TREATED CROSS-TIES, WOOD SCREWS, AND THIOLLIER HELICAL LININGS

The results of a series of experiments with screw spikes on the Pennsylvania Lines, which have been under way for several years, were published recently in Bulletin 165 of the American Railway Engineering Association, from which the following abstract is taken. In the introduction W. C. Cushing, chief engineer maintenance of way, Southwest System, Pennsylvania Lines, stated that these experiments were undertaken to determine if it would be possible to find suitable rail fastenings which would enable them to obtain the full life of a preserved cross-tie until it should perish by decay. The methods used in placing these screw spikes were those in common use in France, and the screw spikes used were obtained from France. The trial showed that the screw spikes were too small, the method of placing—without shoulder support for the head—defective, and the problem of rust is still so serious that such kinds of fastenings are rendered ineffective in altogether too short a time. As a result of these tests, more elaborate tests have been inaugurated on the Pennsylvania Railroad and on the northwest System of the Pennsylvania Lines West of Pittsburgh, which are under the charge of a joint committee of the lines east and west. The screw spike used is much larger. Some of the same difficulties are arising in the new tests, which indicate that a screw spike is not a successful device for securing rails to wooden ties, unless a successful method of repairs from time to time can be devised which will enable one to "cure" the screw spike when it becomes loose, which it has done here in the course of time in many instances, under heavy traffic and severe conditions. Final judgment is, however, reserved for the completion of the tests now being conducted.

In describing the experiment with treated cross-ties, wood screws and Thiollier helical linings at Scio, Ohio, R. D. McKeon, assistant division engineer, stated that during the months from June to November, 1907, inclusive, the fastenings were installed on the eastward main track west of Scio, Ohio. The timbers used in the experiment were Kentucky short-leaf pine and red oak, treated with 0.33 gal. of creosote per cu. ft. of timber. After an inspection of the track in February, 1913, it was decided that it would have to be gaged at once, for it had become as wide in places as it should be allowed to go, and since common spikes would have to be used in the gaging, the experiment would be brought to a close and a final report prepared.

The reasons for the discontinuance of the experiment were:

(1) The screw spikes were not large enough, and the plan of placing them was not sufficiently good to furnish enough lateral resistance to prevent the widening of the gage. No device for adjustment was provided.

(2) The tie plates were almost entirely destroyed by rust, and many of the screw spikes and Thiollier linings were badly corroded, so that their holding power was destroyed. This condition is supposed to be aggravated by brine drippings from refrigerator cars.

(3) The holding power of screw spikes is greater than that of the hook spikes commonly used, but the forces tending to loosen them are very great, unless the surface of the track is kept in a high state of perfection.

(4) The above defects having developed in 5½ years, it is plain that the fastenings must be adapted for repair work, or the full term of life for creosoted ties cannot be obtained.

The following conclusions were also derived:

(1) Screw spikes offer a greater resistance to extraction than common spikes.

(2) Screw spikes will remain tight for a longer period than common spikes if the track is well maintained.

(3) By reason of greater holding resistance they tend to reduce creeping of the rail and also to prevent the slewing of the ties, but this action is not complete and entirely satisfactory.

(4) Screw spikes do not cause the ties to split, as do the common spikes, on account of boring the holes in advance.

(5) The cost of maintenance of track for screw spikes was from two to four times as great as for common spikes, up to the time of discontinuing the experiment.

(6) Screw spikes cost from two to three times as much to apply as common spikes, and their first cost is considerably greater.

(7) When screw spikes break, it is impossible to extract the stump from the hole, and when tie plates are used it is either impossible or very costly to exchange the tie plates so as to allow the proper number of spikes to be used. This can be a very serious matter when the spikes are cut off by a derailment.

(8) It is impossible to gage the track which is laid with screw spikes or to straighten rail which is canting on curves when placed in accordance with the plan used for this experiment.

(9) It is impossible to remove screw spikes which have rusted in order to replace them with new ones.

(10) It would seem desirable to fasten the tie plates to the tie with screw or common spikes so that the sawing action of the plate, under traffic, would be eliminated and reduce the cutting of the plate into the tie. The plate must be held firmly to the tie.

(11) The screws should be applied by some mechanical device, so that each screw would bear equally against the rail

STATEMENT SHOWING COST OF MAINTENANCE PER FOOT OF TRACK ON EXPERIMENTAL TRACK, SCIO, OHIO—February, 1910, to January 31, 1913

Type of Track	Surfacing	Lining	Gaging	Tightening rail fastenings	Renewing rail fastenings	Tightening joint bolts	Renewing joint bolts	Total labor	Cost of material used in renewal	Grand total
Treated Red Oak Ties— Screw spikes, lining and tie plates (No. 4 and No. 6)	$.3332	$.0372	$.0093	$.0231	$.1240	$.0006	$.0036	$.5309	$.2887	$.8196
Treated Red Oak Ties— Screw spikes and linings (No. 7)	.1651	.0413	.....	.0365	.0964	.....	.0011	.3405	.3419	.6824
Treated Pine Ties— Screw spikes, linings and tie plates (No. 1 and No. 5)	.1502	.0483	.0069	.0222	.0880	.0014	.0020	.3190	.3376	.6566
Treated Red Oak Ties— Common spikes (No. 8)	.1730	.0081	.0028	.0299	.0023	.0034	.....	.2195	.0035	.2230
Treated Red Oak Ties— Common spikes and tie plates (No. 3)	.1211	.0493	.0088	.1367	.....	.....	.....	.3159	.....	.3159
Treated Pine Ties— Common spikes and tie plates (No. 2)	.2045	.0021	.0026	.0277	.....	.....	.....	.2369	.....	.2369

Cost figures previous to February, 1910, are not separated between various kinds of fastenings.

(12) Some method should be devised to overcome the effect of the brine from refrigerator cars on track fastenings. The failure of these fastenings was due largely to the rusting of tie plates and screws.

With a few exceptions the widest gage found at the time of final inspection was 4 ft. 9 in., a great deal of the track being 4 ft. 8¾ in. and 4 ft. 8⅞ in. The percentage of loose screws varies from 10 on group 7 to 41 on groups 4 and 6 on curves. The small percentage of loose screws on group 7 may be attributed to the fact that no tie plates were used. The rusting away of the tie plates evidently caused a great many of the screws to become loose, as this permitted greater wave motion in the rail under traffic, subjecting the screws to greater strain and causing them to work loose. An examination of the track without tie plates showed that the rail and tie were held rigidly to each other under traffic, while on the tracks laid with tie plates only the rail moved up and down under traffic.

The condition of the intermediate screws and tie plates was very bad, many of the plates having rusted almost entirely away, presumably largely due to the action of the brine from refrigerator cars. The screws in some cases were almost destroyed, their threads having been taken away, permitting the screws to be lifted out of the ties. Many screws were worn under the head and bent. The bending could be overcome by designing a tie plate that would support the head of the screw and assist in resisting the lateral thrust of the rail. The tie plates had all cut into the ties about a quarter of an inch, as had the rail on the ties without plates. Some ties were crushing under the plates. With the exception of being loose, the joint screws and plates were in good condition. Some screws could be raised an inch, due, no doubt, to the tie decaying around the lining, permitting it to become loose.

The joint screws which were installed in 1910 with Lakhovsky linings, clips and larger tie plates were giving satisfactory service. They were not bent and all were in good condition with the exception of a few of the linings being loose, as noted above. At a great many of the joints the rail, tie and tie plates seemed to be held firmly to each other, and the entire joint moved up and down under traffic. The joints were all in fairly good line and surface, and this type of fastening seemed to give much better service than the smaller intermediate screws.

The ties apparently were in good condition; a few were split and several broken and decayed, but the greater part were in as good condition as when installed. The general condition of the track was good, the failing of the screws being principally due to the action of the brine on them and on the tie plates, and to the design being too light.

The following statement of the cost of this experiment is taken from an appendix to this report by W. D. Wiggins, division engineer, Pittsburgh division:

COST PER SINGLE TIE, FITTED WITH SCREW SPIKES AND HELICAL LININGS

	Labor	Material	Total
Original cost per tie, including freight and dating nails	.....	.65	.65
Creosoting ties	.....	.30	.30
4 screw spikes with helical linings	.....	.1496	.1496
2 Glendon tie plates, punched for screw spikes	.....	.2624	.2624
Boring, threading and inserting linings	.27	.....	.27
Adzing	.0496	.....	.0496
Unloading and piling	.0447	.....	.0447
Placing ties in track and surfacing	.429	.....	.429
Total	.7935	1.3620	2.1553

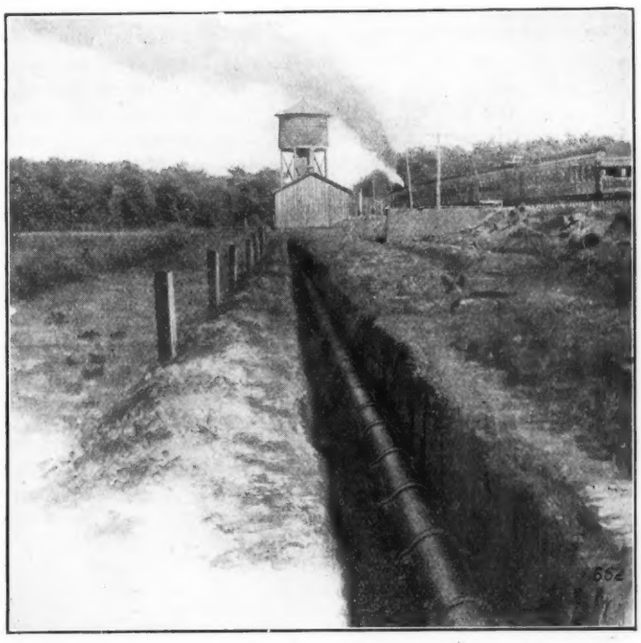
COST PER SINGLE TIE, FITTED WITH COMMON SPIKES

	Labor	Material	Total
Original cost per tie, including freight and dating nails	.....	.65	.65
Creosoting ties	.....	.30	.30
Glendon tie plates punched for common spikes	.....	.2412	.2412
Common spikes per tie	.....	.0640	.0640
Adzing	.0496	.....	.0496
Unloading and piling	.0447	.....	.0447
Placing ties in track and surfacing	.429	.....	.429
Total	.5233	1.2552	1.7785

Note.—Unit prices do not include angle bars or tools, except augers and threading tools worn out in boring ties. Item of cost of placing ties in track includes cost of distributing ties, placing same in track and applying tie plates.

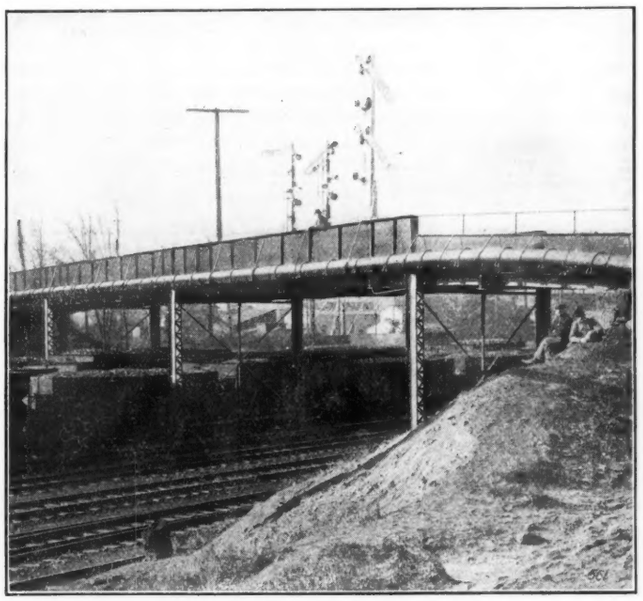
UNIVERSAL CAST IRON PIPE

Cast iron pipe which includes a universal joint as an integral part of the pipe has been used with satisfaction by a number of railways for water service lines at terminals and



Pipe Lines Supplying Track Tanks on the Pennsylvania Lines West at Hamlet, Ind.

locomotive water stations. The joint consists of hub and spigot ends machined to slightly varying tapers, which, when drawn together by bolts passing through lugs at the end of the pipe, make a tight and flexible joint. The flexibility is



Pipe Lines on the Central Railroad of New Jersey Carried Over Track on Highway Bridge

sufficient to allow the pipe to follow any railroad curve with straight lengths of pipe and as a matter of fact, a much shorter radius can be used in one of these pipe lines than is possible on a railway track.

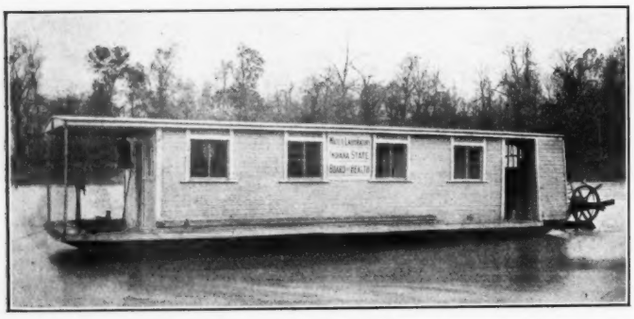
The joint can be made up with a ratchet wrench and no

caulking or special equipment is required. Ordinary laborers are employed in making these joints, thus effecting a saving over the wages of skilled workers. A pipe line laid with these joints can be taken up and relaid if desired, the process of taking the points apart being the reverse of the making up operation. The pipe is made in lengths of only 6 ft, which also facilitates the handling of the work.

The accompanying illustrations show a 14 in. pipe line supplying the track of the Pennsylvania Lines West at Hamlet, Ind., and a 16 in. line carried on an overhead highway bridge on the Central Railroad of New Jersey. The latter installation is subject to excessive vibration due to the passage of traffic over the highway bridge and of heavy freight trains on the tracks beneath. It has been found, however, that this pipe line keeps tight even during severe temperature changs to which it is exposed. This pipe is manufactured by the Central Foundry Company, New York.

LIFTING A HOUSE BOAT OVER A TRESTLE BRIDGE

A sanitary survey of the White river and the waters emptying into the river is being made at considerable expense by the State Board of Health of Indiana. When the house boat in which the water chemist of the board and his assistant were making the survey reached the timber trestle which the Baltimore & Ohio built across the river near Washington, Ind., to replace its bridge destroyed by last year's flood, it seemed for a time that the survey would have to be abandoned. The trestle bents were about 10 ft. center to center and the boat was 13 ft. wide, precluding any possibility of passing through the trestle.



The House Boat Which Was Lifted Over a Trestle Bridge

Wrecking Crane and Derrick Car Lifting a House Boat Over a Bridge

When the predicament of the health department boat was called to the attention of the Baltimore & Ohio officers, they volunteered to send an Industrial Works wrecking crane to lift the boat over the deck of the trestle. The wrecking crew first made a raft of 10 in. by 12 in. stringers on which the boat was placed. A timber frame was then built over the roof of the boat and tied to the raft with 2-in. cables. This overhead frame offered a suitable point of connection for the lifting line from the wrecking crane. When all was ready it was found that the boom was too short to swing the boat clear of the structure and it was therefore necessary to bring out a derrick car to help the crane. The longer boom on the derrick car made it possible to swing the boat clear of the structure, and in about one-half hour the two machines had lifted it clear of the bridge, swung it to the other side and lowered it again to the stream. About 1½ days were consumed in the preparation for the work. Much valuable material was stored in the boat, such as bacteria plates, and the chemist in charge was very gratified to find that the move had been made without disturbing the contents of the boat in the least. The boat is 35 ft. long and weighs about 8 tons. The height of the trestle is about 35 ft.

ORGANIZATION OF WORK TRAIN FORCES*

By T. C. Crea

Supervisor of Structures, Bessemer & Lake Erie, Greenville, Pa.

When unloading ties it is customary for the supervisor to know the exact number needed on each mile of track, and if it is possible he should have all ties for the year's renewals on the ground by April 1, using the regular section forces from three adjoining sections, assisted by a regular extra gang foreman and enough men to make a total of 24, which will permit the unloading of three cars at a time with six men in each car and one man to tally, two men on the ground to pile ties back from the track. The foreman of the section, using the information handed him by the supervisor, can spot the cars and tell the men on the cars how many are needed at each place. The supervisor, when possible, should give this work some of his time each day, and the work should be begun at one end of the division and carried through continously until completed. Of course, when there are not enough ties for the year's renewals in sight there should be some distributed on each section, taking special care to select the spots where they are most needed.

When distributing rail, without a rail handling machine, flat cars should be used, if possible, as it is too difficult and expensive to unload from gondolas on main track, and there is a probability that some rails unloaded from such cars will be bent. This work can be handled very readily by six men to a car and never unloading more than three cars at a time on account of poor spacing. For picking up rail it requires 16 men to a rail, and on account of expense and liability of injury to some of the men this method should never be followed where there is a machine available.

In distributing ballast it is best to have it loaded in hopper cars on account of the ease with which it is unloaded. The following method has been used with great success: Place two ties on the rails in front of the rear trucks of a car, and open the forward pocket, thus keeping the weight over the trucks that the ties are in front of. The pocket can be opened to desired width and held there with a shore, thus allowing the ballast to be applied as required. This can also be regulated by the movement of the train. It is not uncommon to unload 30 to 40 cars a day where traffic is not dense and the total labor amounts to eight men in the car and two on the ground in addition to the foreman. Any kind of ballast may be distributed in this manner without danger of derailing the car and the ballast so distributed is where it is needed and not along the ends of the ties.

Ditching should be done as soon as the frost is out of the ground in the spring, and care should be taken to have a large force of men, as six men can be used with each car, and ten cars to a train. Care should also be taken in the selection of a spot to unload, making the haul as short as possible.

*Received in the contest on The Proper Handling of Work Trains which closed December 27, 1913.

General News Department

An agreement has been reached between the Illinois Central and its telegraph operators and station agents providing for a 6 per cent. advance in wages and some changes in working conditions.

The Oregon-Washington Railroad & Navigation Company was fined $3,350 in the United States district court at Portland, Ore., last week, for violation of the hours of service law.

At the Anglo-American Hundred Years Peace Exposition, now open in London, the Southern Railway has the only exhibit made by an American railway. It is a handsome display of the agricultural, horticultural and mineral products of the Southern states.

The employees and officers of the St. Louis Southwestern, from president down, with the exception of certain employees in the transportation and mechanical department, will be required to take a three days' vacation without pay during the month of June.

The General Managers' Association of Texas has appointed a committee of three, consisting of one representative each from the Fort Worth & Denver, Chicago, Rock Island & Gulf and St. Louis & San Francisco, to investigate a proposal to establish a system of joint scale inspection in connection with the Texas Grain Dealers' Association.

On the Pennsylvania Railroad, by a recent order, whenever passenger coaches are crowded, a train man must announce the number of seats available in other coaches, and must tell the number of seats available in each coach. Special care must be exercised at the larger terminals where passengers are liable to be inconvenienced by the congestion of travel.

The St. Louis Southwestern, on its lines in the wheat belt, has discharged 500 negro laborers, with the expectation that the discharged men can quickly get work with the farmers along the line. During the winter and spring the road has continued these men at work, notwithstanding the general slackening of income, taking advantage of the low prices of labor and awaiting a suitable time to let the men out.

Eleven thousand Italians are employed on the Pennsylvania Railroad, and the company has issued a leaflet telling something of their activities. These men are not all laborers, a list being given showing twenty-five or more different occupations, in which they are engaged. On the Pittsburgh division there are twenty-seven Italian track foremen and 42 assistant foremen. More than 2,000 Italian employees of the road are studying English in a correspondence course, maintained by the company for their benefit.

The general safety committee of the Intercolonial, of which F. P. Gutelius, general manager of the road, is chairman, has during the past month organized eleven safety committees, the membership of which is composed of 230 employees and 45 officers. J. E. Long, safety engineer, who is secretary of the general committee, has issued a booklet containing instructions and advice for members of the committee and for all employees; and also setting forth the organization of the committees at different points on the road.

Dr. Harold Pender, professor of electrical engineering, at Massachusetts Institute of Technology, and director of the research division of the department of electrical engineering, has been appointed professor-in-charge of the department of electrical engineering at the University of Pennsylvania, to take the place next fall. Heretofore the departments of mechanical and electrical engineering at the Univeristy of Pennsylvania have been under the joint direction of the Whitney professor of dynamical engineering. From the beginning of next year the department of electrical engineering will be on an independent and co-ordinate footing with the departments of civil and mechanical engineering.

The Judiciary committee of the Senate held hearings at Washington this week on the Clayton bill, designed to amend or supplement the anti-trust law. There was no formal vote, but action was taken looking to the elimination of a part of section 7, which, as drawn, would permit traffic agreements, except pooling, between interstate railroad carriers. The Senate committee on interstate commerce has held hearings on the Rayburn bill. Representatives of interurban electric roads appeared and protested against the inclusion of such roads in the proposed law regulating the issuance of stock and bonds, declaring that their business is almost wholly intrastate. Representatives of the smaller telephone companies also made protests of a similar nature. Senator Newlands, of Nevada, on Tuesday, introduced a bill for federal incorporation of railroads, the same, in substance, as the bill which he has introduced in former Congresses.

The strike at the Westinghouse factories in East Pittsburgh which began June 5, and in which about 10,000 employees walked out with the members of the "Allegheny Congenial Industrial Union," on Friday, June 12, spread to the plant of the Union Switch & Signal Company at Swissvale, where between 1,100 and 1,400 employees left their work. Reports from Pittsburgh this week, Tuesday, said that the spirit of optimism seemed to prevail among the officers of the Westinghouse companies, the feeling being that in a short time there would be a general movement to return to work. The employees of the Union Switch & Signal Company walked out without presenting any reasons for so doing. The company promptly announced that the works would be shut down until Monday, at which time the employees would be expected to return. Practically the full quota of men did return. This, coupled with the unsuccessful attempt of the strikers to call out the men at the Westinghouse foundries at Trafford City, was taken to indicate a speedy return to normal conditions.

On June 13 and 16 the Long Island Railroad carried more than 50,000 people between New York and the polo grounds at Meadow Brook, Long Island, all without accident to either passengers or employees. About 15,000 passengers were taken to Manhattan and Brooklyn after Tuesday's game was over. Saturday, the 13th, was one of the biggest days the Long Island Railroad has ever had, in that it carried, on all its lines, about 300,000 passengers, 23,000 of whom were passengers to and from the first polo game. Twenty-four trains were unloaded at Meadow Brook on Tuesday in little more than an hour; and all this business was handled on a single track branch line which ordinarily is but little used for traffic. The Pennsylvania station, New York, which is the Long Island terminal in Manhattan, received and despatched more trains in the four days ending Tuesday midnight, than during any similar period since the station was opened to the public. In these four days over 1,600 trains were handled there, and it is estimated that 750,000 people availed themselves of the facilities of the station, while the number of passengers arriving and departing was over 570,000, an average of more than 142,000 per day. The largest number using the station in any one day was on Saturday, approximately 170,000. All of the additional traffic was handled without any delay to the regular trains.

Safety First on the Burlington*

We have on this division—and I do not suppose we are alone in that respect—a number of men who are inclined to look on the safety movement as some new move of the company to exploit the men to the company's advantage. This idea in some cases is so fixed that it is almost impossible to dislodge it, yet it has not the slightest foundation. No general movement for the benefit of the employee can be successful without the co-operation of the employee himself. On the part of the official there is an interested sincerity which should go far to convince doubters. It is

*From an address by J. L. Davis, fireman, C. B. & Q. R. R., Galesburg, Ill.

to every employee's own advantage to use every possible precaution to prevent any injury to himself or others. In one place the amount of money expended in the prevention of accidents was about $65 for each man saved.

. . . Judging by the records of persons killed we need more stringent laws against trespassing, almost four times as much as we do the compulsory elimination of grade crossings, about which there is so much agitation.

Mechanics are not supposed to be vain; yet in machine shops many workers are hurt by flying metal chips and the dust from grinding operations, simply because they will not wear the goggles and respirators that would give protection. Factory inspectors say the chief reason is appearance; goggles make a man look like a guy; and the inspectors themselves admit that, in visiting shops where these devices should be worn, they themselves seldom wear them, and for this reason.

As members of the committee we should at all times keep the employees' interest unflagging; keep the officers informed of any known dangerous conditions or practices, that all may be forewarned; watch new employees that they do not form dangerous habits; teach the inexperienced that they may have a long and successful service. . . .

American News by Special (Wireless?) Cable from England

On June 9 the Chicago *Examiner* published a two-column interview predicting government ownership for the railways in the United States labeled "Special Cable to the *Examiner;* London, June 8." The first sentence said this statement "was given to the *Examiner* tonight by Newman Erb, president of the Minneapolis & St. Louis, Denver & Salt Lake," and other roads. The railroad column of the St. Louis *Globe-Democrat* for June 8, contained the following item: "Newman Erb, president of the Ann Arbor and the Minneapolis & St. Louis, arrived in the city late last evening from New York City."

Report on Westerly (R. I.) Broken Rail

On October 25, 1913, a passenger train on the New York, New Haven & Hartford, consisting of three Pullman cars, one smoking car and two day coaches, was derailed near Westerly, R. I., resulting in the injury of 74 passengers and three employees. An investigation of this accident was made by the Interstate Commerce Commission in conjunction with the Public Utilities Commission of Connecticut, and a report has just been issued by H. W. Belnap, chief inspector of safety appliances of the Interstate Commerce Commission, including a detailed study of the rail by James E. Howard, engineer physicist of the commission.

The train was derailed about 9:30 p. m. during a rain. Neither the engine nor the tender left the track, although all the cars went off. This accident happened on a double track line on a descending grade of about .5 per cent., and about 2,000 ft. on tangent. The track was laid with 100-lb. rails, 33 ft. long, single-spiked to 18 or 19 ties to the rail, with 12 in. to 16 in. of gravel ballast under the ties.

The cause of the derailment was a broken open hearth rail rolled by the Bethlehem Steel Company in April, 1910, and laid in track the following month. It was a "C" rail of N. Y. N. H. & H. pattern. At the time of derailment this rail fractured in three places, at two of which transverse fissures were exposed, measuring about 1½ in. in diameter each. After the accident an additional fracture occurred when removing the rail from the track, revealing a transverse fissure 1¾ in. in diameter. The rail was then shipped to Providence, where two more transverse fissures were disclosed, when one end of the rail was raised about 6 ft. and allowed to fall upon a concrete walk. These fissures measured 1¾ in. and ⅝ in. in diameter, respectively. These five fissures were all located on the gage side of the rail at distances of 1 ft. 10 in., 6 ft. 7 in., 12 ft. 1 in., 17 ft. 8 in., and 21 ft., respectively, from the leaving end of the rail.

A second rail from the same heat, laid at the same time and exposed to the same conditions of service, was removed from the track and its structural condition compared with that of the broken rail, although the position of this second rail in the ingot was not given in the report. Chemical analysis showed that these two rails were of practically identical composition, barring slag, the rail which failed in service having three or four times as much slag as the other rail.

After a careful examination Mr. Howard concluded that no unusual segregation of impurities was found, that the structure throughout the section of the rail was very uniform, and that the metal immediately adjacent to the transverse fissures appeared to be of the same nature as that throughout the rest of the rail.

Drop tests were made on one piece of the failed rail and two pieces of the other rail, the section of the failed railed passing the requirements of the specifications under which the rails were rolled, that it should show a deflection of not more than 1.45 in. on the first blow. Further tests made by the railroad at its laboratory showed the presence of a considerable number of incipient fissures in the head of the failed rail where the ordinary manifestations of transverse fissures were not in evidence. These fissures range in length from a few hundredths of an inch to ⅜ in.

Mr. Howard further concludes that this rail showed nothing in its structure to indicate any abnormalities in the mill practice, and that the general structure of the two rails is such as to warrant the statement that they are of a carbon content that will not afford a toughness and ductility comparable with that of a properly treated rail of a lower carbon content (the carbon in the rails under investigation being 0.83), hence the transverse fissures. To remedy this condition two courses are open—to fix the carbon limit and to prescribe the mill treatment which will insure the maximum toughness and ductility with a sufficient strength; or to reduce the wheel loads.

A Bill to Regulate Interstate Commerce by Water

The chairman of the committee on Merchant Marine and Fisheries has introduced in the lower house of Congress a bill to regulate carriers by water in interstate and foreign commerce. The bill would put this branch of commerce under the supervision of the Interstate Commerce Commission, and the number of commissioners is increased by the bill from seven to eleven to provide for the additional work. The bill is said to be aimed at the "shipping trust," but it does not forbid traffic agreements between different carriers. All deferred rebate arrangements are declared illegal. Copies of all agreements between carriers must be filed with the Interstate Commerce Commission for approval, and when approved, the parties will be exempt from prosecution under the anti-trust law. Both foreign and domestic carriers are prohibited from carrying retaliatory measures against shippers to the extent of refusing or threatening to refuse space when space is available. Rate-cutting to injure a competitor is prohibited; and the commission may reduce rates which are found excessive. The bill makes it unlawful for any railroad to discriminate between a rail and a water route. The railroads must not acquire any interest in any canal or in any common carrier on a canal except on approval of the commission. Free transportation is prohibited.

There is no indication that this bill will be passed at the present session of Congress.

Southern Railway Improvements at Memphis

The Southern Railway has begun the construction of a large classification yard and engine terminal at Buntyn, six miles east of Memphis, Tenn., and the contract for grading the grounds has been let to C. W. Lane & Co., of Atlanta, Ga. The new terminal will be named Forrest. Two groups of tracks will be laid, a receiving yard and a distributing yard, with an aggregate length of track of about 15 miles. The eastbound classification yard and the westbound receiving yard will have 12 tracks with a capacity of 60 to 65 cars each, while the eastbound receiving and the westbound classification yards will be of about the same extent. The roundhouse will have 18 stalls and a 90 foot turntable, to be worked by power. The coal plant will be of reinforced concrete and have a capacity of 1,000 tons. There will be a small machine shop and a shed for freight car repairs. A two-story office building and a track scale of large capacity will complete the plant.

In the Service Seventy Years

James C. Fargo, president of the American Express Company, has resigned and has been succeeded by George C. Taylor, of

Chicago, vice-president of the company. Mr. Fargo is 85 years old. He has been president of the express company since 1881, and has been connected with the company since 1844.

Seventh Congress of the International Association for Testing Materials

The seventh congress of the International Association for Testing Materials will be held under the patronage of the Czar of Russia, in St. Petersburg, August 12-17, 1915. Four days will be devoted to the discussion of the most important problems on testing materials. After the congress extensive excursions in the interior of Russia have been arranged.

International Railway Fuel Association

It is announced that the seventh annual convention of the International Railway Fuel Association will be held at Chicago, May 17-20, 1915, inclusive.

MEETINGS AND CONVENTIONS

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass.

AMERICAN ASSOCIATION OF DINING CAR SUPERINTENDENTS.—H. C. Boardman, D. L. & W., Hoboken, N. J. Next convention, October, Washington.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, 143 Liberty St., New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, I. C. R. R., East St. Louis, Ill.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, Room 101, Union Station, St. Louis, Mo. Next convention, August 20 and 21, New York.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—E. B. Burritt, 29 W. 39th St., New York. Annual convention, October 12-16, Atlantic City, N. J.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—H. G. McConnaughy, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Next convention, October 20-22, 1914, Los Angeles, Cal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Next convention, March 16-18, 1915.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Karpen Building, Chicago.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga. Next convention, July 20-22, Hotel Sherman, Chicago.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa. Next annual meeting, June 30 to July 4, Hotel Traymore, Atlantic City, N. J.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—Chas. W. Hunt, 220 West 57th St., New York; 1st and 3d Wed., except June, July and August, New York. Annual convention, June 3-5, Baltimore, Md.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 11 Broadway, New York; 2d Thursday of each month, at 2 P. M., 11 Broadway, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York. June 16-19, St. Paul-Minneapolis, Minn.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 19-21, 1915, Chicago.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—E. R. Woodson, 1300 Pennsylvania Ave., Washington, D. C. Annual meeting, June 24, Minneapolis, Minn.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—C. W. Egan, B. & O., Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June 12, Hotel Denis, Atlantic City, N. J. Annual convention, October 19-23, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York. Annual meeting, Hotel Chalfont, Atlantic City, N. J., June 18-19.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—L. D. Mitchell, Detroit Graphite Co., Chicago, Ill. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and August, Windsor Hotel, Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 176 Mansfield St., Montreal, Que.; 1st Thursday, October, November, December, February, March and April, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 Lawler Ave., Chicago; 2d Monday in month, except July and August, Lytton Bldg., Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Fri. in Jan., May, Sept. and Nov. and 2d Thurs. in March, Hotel Statler, Buffalo, N. Y.

CIVIL ENGINEERS SOCIETY OF ST. PAUL.—Edw. J. Dugan, P. O. Box 654, St. Paul, Minn.; 2d Monday, except June, July, August and September, Old State Capitol Bldg., St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—Edw. R. Dasher, Box 75, Harrisburg, Pa.; 1st Friday after 10th of each month, except July and August, 31 So. Front St., Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—Elmer K. Hiles, Oliver Bldg., Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—A. M. Hunter, 605 Grand Central Station, Chicago; Wed. preceding 3d Thurs., Transportation Bldg., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick Bldg., Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 14-17, Hotel Sherman, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Next convention, third Tuesday in August.

MAINTENANCE OF WAY AND MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—T. I. Goodwin, C. R. I. & P., Eldon, Mo. Next convention, November 17-19, 1914, Detroit, Mich.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Karpen Building, Chicago.

MASTER CAR & LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Next convention, September 8-11. Nashville, Tenn.

NATIONAL RAILWAY APPLIANCES ASSOCIATION.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Next convention, March 15 to 19, 1915, Chicago.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NIAGARA FRONTIER CAR MEN'S ASSOCIATION.—E. Frankenberger, 623 Brisbane Bldg., Buffalo, N. Y. Meetings monthly.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Thursday in month, Jefferson Hotel, Peoria.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILROAD MASTER TINNERS, COPPERSMITHS & PIPEFITTERS' ASSOCIATION.—U. G. Thompson, C. & E. I., Danville, Ill.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 30 Church St., New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City Southern, Kansas City, Mo.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY FIRE PROTECTION ASSOCIATION.—C. B. Edwards, Mobile & Ohio, Mobile, Ala. Annual meeting, 1st Tuesday in October.

RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Annual meeting, Bluff Point, N. Y., September 22-24.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 2136 Oliver Bldg., Pittsburgh, Pa. Meetings with M. C. B. and M. M. Associations. Atlantic City, June 10 to 17.

RAILWAY TELEGRAPH & TELEPHONE APPLIANCE ASSOCIATION.—G. A. Nelson, 50 Church St., New York. Meetings with Assoc. of Ry. Teleg. Supts.

RICHMOND RAILROAD CLUB.—F. O. Robinson, C. & O., Richmond, Va.; 2d Monday in month, except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Next convention, September 8-10, 1914, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SALT LAKE CITY TRANSPORTATION CLUB.—R. E. Rowland, Hotel Utah Bldg., Salt Lake City, Utah; 1st Saturday of each month, Salt Lake City.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmunds, 3868 Park Ave., New York. Meeting with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—Carl Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Atlanta, Ga. Next meeting, July 16, Chattanooga, Tenn.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant Bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., 10 A. M., Candler Bldg., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. S. Marks, Agent, Interstate Despatch, Toledo, Ohio; 1st Saturday in month, Boody House, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meetings with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 291 Broadway, New York; last Tuesday in month, except June, July and August, Waldorf-Astoria, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie R. R., Pittsburgh, Pa.; meetings bimonthly, Pittsburgh. Annual meeting, 2d Monday in June.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library Building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7122 Stewart Ave., Chicago. Next convention, June 16, Jacksonville, Fla.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, Supt.'s office, L. S. & M. S., Detroit, Mich.; meetings monthly, Normandie Hotel, Detroit.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Next meeting, September 15-18, Hotel Sherman, Chicago.

UTAH SOCIETY OF ENGINEERS.—Frank W. Moore, Newhouse Bldg., Salt Lake City, Utah; 3d Friday of each month, except July and August, Consolidated Music Hall, Salt Lake City.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, 1112 Karpen Building, Chicago; 3d Tuesday of each month, except June, July and August, Karpen Building, Chicago.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; regular meeting 1st Monday in month, except January, July and August, Chicago. Extra meetings, except in July and August, generally on other Monday evenings.

REVENUES AND EXPENSES OF RAILWAYS

MONTH OF APRIL, 1914—CONTINUED

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total. inc. misc.	Way and structures.	Of equipment.	Traffic.	Trans-portation.	General.	Total.					
Detroit, Toledo & Ironton	441	$97,454	$8,821	$117,180	$70,928	$78,971	$2,673	$68,336	$5,790	$226,698	—$109,518	.....	$5,700	—$115,218	$8,219
New York, Ontario & Western	566	580,875	100,803	711,422	78,308	142,709	10,132	295,240	16,317	542,706	168,716	—$4.115	19,000	45,601	—9,866
New York, Philadelphia & Norfolk	112	252,678	39,601	313,610	27,644	61,598	4,170	140,172	14,201	247,785	65,825	.....	8,700	57,125	—3,305
New York, Susquehanna & Western	141	179,950	42,930	243,379	19,705	32,524	1,853	102,219	5,091	161,392	81,987	1,528	5,298	78,217	—17,348
Norfolk & Western	2,037	3,075,856	382,107	3,561,536	358,972	732,730	57,552	1,106,593	73,427	2,329,274	1,232,262	—1,204	140,000	1,091,058	472,345
Northern Central	472	805,609	187,698	1,059,713	145,026	221,147	12,764	514,312	26,491	919,740	139,973	522	36,719	103,776	41,319
Norfolk Southern	860	282,273	71,440	374,279	92,346	74,179	5,932	178,913	18,395	369,765	4,514	—3,790	10,797	—10,073	—138,577
Northern Pacific	6,314	3,673,310	1,106,514	5,142,647	706,405	684,030	100,070	1,703,873	94,271	3,288,649	1,853,998	178	483,945	1,370,231	102,570
Northwestern Pacific	401	99,500	158,834	280,380	40,288	56,700	4,525	108,178	12,995	222,686	57,694	.....	15,498	42,196	—2,414
Oahu Ry. & Land Co.	102	61,164	23,626	91,486	8,999	7,843	676	21,632	4,353	43,503	47,983	.....	7,250	40,733	—1,486
Oregon Short Line	2,120	1,151,827	378,743	1,657,427	218,903	219,838	30,375	407,795	49,326	926,237	731,190	—6,782	108,407	616,001	24,073
Oregon-Washington R. R. & Nav. Co.	1,915	819,887	363,227	1,285,322	182,104	159,478	41,132	452,512	53,791	889,017	396,305	—3,227	107,176	285,902	—13,976
Pecos & Northern Texas	570	144,784	30,967	187,129	19,695	36,953	2,905	64,862	6,745	131,160	55,969	.....	7,083	48,886	6,424
Pennsylvania *Co.*	1,750	3,040,087	795,196	4,220,245	630,761	886,006	80,265	1,649,255	172,778	3,419,065	801,180	—6,314	276,217	518,649	130,763
Pennsylvania *Railroad*	4,044	10,175,958	2,971,112	14,170,552	1,737,108	2,759,262	172,185	5,161,745	394,564	10,224,864	3,945,688	—125,108	587,620	3,232,960	402,501
Pere Marquette	2,322	1,016,361	265,754	1,393,966	234,094	352,290	34,180	594,329	42,115	1,257,008	136,958	4,009	58,969	81,998	—97,083
Philadelphia & Reading	1,020	3,204,949	527,812	3,914,698	522,093	710,185	41,742	1,346,980	77,773	2,698,773	1,215,925	84,304	102,557	1,197,672	—226,013
Philadelphia, Baltimore & Washington	717	826,486	696,122	1,695,102	222,477	286,839	23,950	728,960	41,995	1,304,221	390,881	.....	52,961	337,920	134,211
Pittsburgh & Lake Erie	224	1,127,729	135,014	1,311,468	148,480	345,512	15,862	352,545	29,714	892,113	419,355	207	53,500	366,062	—352,781
Pittsburgh, Cincinnati, Chic. & St. Louis.	1,472	2,070,274	650,239	3,054,297	454,077	659,335	68,225	1,251,534	110,561	2,543,732	510,565	—684	159,620	350,261	567,815
Pittsburgh, Shawmut & Northern	282	72,457	12,630	86,959	16,886	27,324	1,658	41,053	4,706	91,627	—4,668	.....	1,817	—6,485	—35,290
Port Reading	21	112,326	.....	114,980	14,685	1,162	38	40,464	179	56,528	58,452	1,270	19,000	40,722	—57,220
Richmond, Fredericksburg & Potomac	88	149,220	96,565	277,608	34,388	27,262	2,793	95,191	7,202	165,836	110,772	—3,408	8,000	99,364	—31,162
Rutland	468	157,446	98,054	290,023	29,118	49,076	8,740	126,001	5,862	218,797	71,226	—99	17,596	53,531	32,247
St. Joseph & Grand Island	319	80,983	26,264	117,405	38,840	19,652	5,293	56,936	5,757	126,478	—9,073	.....	7,048	—16,121	—7,936
St. Louis & San Francisco	4,742	2,159,402	757,007	3,152,587	739,166	622,650	70,603	1,177,148	100,144	2,709,711	442,876	.....	98,971	343,905	—498,919
St. Louis, Brownsville & Mexico	518	178,437	72,034	267,662	36,135	26,060	5,696	102,763	12,697	183,351	84,311	.....	7,000	77,311	—20,792
St. Louis, Iron Mountain & Southern	3,365	1,795,719	487,396	2,472,725	312,711	377,250	52,298	800,635	76,989	1,619,883	852,842	—5,077	130,085	717,680	—67,257
St. Louis Merchants' Bridge Terminal	9	.....	268	121,764	22,493	8,416	744	79,557	7,422	118,632	3,132	.....	6,250	—3,118	—14,886
St. Louis, San Francisco & Texas	244	64,244	25,030	95,002	23,284	19,502	2,524	54,604	6,196	106,110	—11,108	.....	1,476	—12,584	—2,077
St. Louis Southwestern	943	466,190	102,021	601,615	72,119	120,778	27,932	182,267	33,944	437,040	164,575	—920	38,316	125,339	—93,829
St. Louis Southwestern of Texas	811	196,629	74,352	297,216	99,505	91,006	12,404	149,883	20,425	373,223	—76,007	—216	15,500	—91,723	—37,902
San Antonio & Aransas Pass	724	200,172	91,391	311,944	79,627	59,351	6,429	161,976	11,823	319,206	—7,262	.....	18,000	—25,262	—64,661
San Pedro, Los Angeles & Salt Lake	1,133	683,850	231,358	968,720	112,760	176,432	31,930	313,371	20,495	658,988	309,732	—3,917	50,947	254,868	76,160
Seaboard	3,082	1,553,757	451,787	2,235,924	223,935	314,586	63,806	809,540	62,670	1,474,537	761,387	—1,830	87,000	672,557	33,462
Southern	7,047	3,838,018	1,404,234	5,691,979	746,630	1,031,327	187,324	2,114,610	188,226	4,268,117	1,423,862	7,791	235,635	1,196,018	—146,596
Southern in Mississippi	281	51,432	29,947	88,639	22,081	11,728	2,666	42,457	4,044	82,976	5,663	.....	7,750	—2,087	17,232
Southern Kansas of Texas	179	103,510	13,377	121,273	10,788	26,511	1,678	40,271	3,841	83,089	38,184	.....	3,676	34,508	—16,230
Southern Pacific Co.	6,487	4,357,830	2,414,813	7,317,838	861,406	1,056,026	158,308	2,151,116	200,233	4,427,089	2,890,749	66,561	452,782	2,504,528	—131,961
Spokane International	163	59,810	16,179	78,601	12,415	5,832	2,177	23,323	3,754	47,501	31,100	.....	3,192	27,908	—5,967
Spokane, Portland & Seattle	556	232,231	124,858	384,674	74,968	36,058	7,524	93,749	12,937	225,236	159,438	—1,325	53,400	104,713	—12,504
Tennessee Central	294	99,863	30,921	138,782	30,489	17,367	5,824	50,102	7,368	111,150	27,632	.....	4,245	23,387	—19,574
Terminal R. R. Ass'n of St. Louis	34	.....	183	208,282	56,025	16,251	895	84,745	6,564	164,480	43,802	7,440	26,385	24,857	—36,373
Texas & New Orleans	458	207,868	96,187	324,704	77,991	71,424	8,445	138,153	13,534	309,547	15,157	—1,268	18,206	—4,317	—32,499
Texas & Pacific	1,885	946,787	324,532	1,365,443	179,453	221,233	39,265	649,401	45,194	1,134,546	230,897	—4,442	62,000	164,455	78,847
Toledo & Ohio Central	446	260,527	46,104	324,476	69,902	83,117	7,848	139,197	11,891	311,955	12,521	—390	20,347	—8,216	—65,693
Toledo, Peoria & Western	248	45,350	34,888	86,241	16,946	22,895	2,654	44,211	3,654	90,360	—4,119	.....	6,800	—10,919	6,966
Toledo, St. Louis & Western	451	287,883	26,269	339,560	37,554	46,917	16,437	152,295	9,239	262,442	77,118	.....	17,500	59,618	58,040
Trinity & Brazos Valley	463	85,758	30,339	126,584	47,028	27,421	8,871	78,477	11,283	173,080	—46,496	.....	4,900	—51,396	14,535
Ulster & Delaware	129	65,623	17,329	87,167	9,185	12,101	1,704	35,733	4,296	63,019	24,148	20	3,500	20,668	—9,516
Union Pacific	3,616	2,675,103	801,993	3,759,815	537,088	582,080	92,075	1,081,591	121,557	2,414,391	1,345,424	—12,959	189,274	1,143,191	—53,496
Union R. R. of Baltimore	9	107,459	22,357	131,725	14,857	.....	.....	4,677	2,499	22,033	109,692	.....	6,181	103,511	—28,592
Union R. R. of Pennsylvania	31	.....	.....	241,196	47,668	98,583	100	135,816	3,159	285,326	—44,130	4,575	6,000	—45,555	—41,631
Vandalia	910	477,335	183,184	740,678	100,385	208,148	27,122	347,469	25,544	708,668	32,010	.....	32,409	—399	20,320
Vicksburg, Shreveport & Pacific	171	98,514	41,134	154,480	24,108	30,497	3,554	53,313	5,826	117,298	37,182	54	7,200	30,036	12,966
Virginia & Southwestern	240	144,796	13,489	162,319	24,119	39,569	2,377	45,444	3,759	115,268	47,051	.....	6,823	40,228	—2,195
Virginian	503	470,873	28,951	513,237	77,970	95,178	4,985	122,414	12,680	313,227	200,010	7,264	16,000	191,274	—9,732
Wabash	2,515	1,530,012	520,796	2,268,856	310,119	461,920	76,641	1,079,384	62,095	1,990,159	278,697	—4,740	99,191	174,766	—240,315
Washington Southern	36	41,327	47,156	116,752	17,323	14,128	1,096	46,729	3,108	82,384	34,368	—2,291	3,500	28,577	—13,681
West Jersey & Seashore	356	158,907	304,627	489,907	71,385	70,996	9,423	196,483	12,897	361,144	128,723	—5,792	26,960	95,971	130,997
Western Maryland	661	588,069	66,749	684,775	136,624	173,208	23,288	294,135	19,294	646,549	38,226	.....	24,500	13,726	—125,635
Western Pacific	943	314,630	109,724	438,622	104,463	68,251	27,628	161,311	22,226	383,879	54,743	—2,740	34,856	17,147	—91,299
Western Ry. of Alabama	133	58,136	41,321	109,032	24,955	24,884	6,637	35,942	5,089	97,507	11,525	—83	5,008	6,434	—1,685
Wheeling & Lake Erie	459	331,957	42,338	407,922	53,834	74,315	9,191	185,245	17,942	340,527	67,395	—21	27,439	39,935	202,521
Yazoo & Mississippi Valley	1,372	586,095	197,412	849,126	163,255	136,587	15,256	360,052	28,999	704,149	144,977	470	46,500	98,947	122,910

REVENUES AND EXPENSES OF RAILWAYS

TEN MONTHS OF FISCAL YEAR ENDING JUNE 30, 1914

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total. inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama & Vicksburg	143	$1,022,512	$418,356	$1,553,968	$239,620	$343,500	$39,304	$562,472	$59,602	$1,244,498	$309,470	—$4,020	$83,343	$222,107	—$116,577
Alabama Great Southern	309	3,101,278	1,087,682	4,547,457	558,264	1,140,593	135,444	1,543,487	109,368	3,487,156	1,060,301	—5,034	158,174	897,093	—169,432
Ann Arbor	292	1,183,998	452,191	1,763,195	198,024	242,362	50,843	664,203	70,107	1,225,539	537,656	—63	136,510	401,083	17,480
Arizona & New Mexico	109	682,077	90,663	806,508	108,303	98,073	7,855	155,298	30,621	400,150	406,358	.....	27,383	378,975	—77,437
Arizona Eastern	367	1,826,838	376,339	2,314,763	312,147	290,719	20,285	635,726	107,378	1,366,255	948,508	584	136,138	812,954	—199,530
Atchison, Topeka & Santa Fe	8,340	51,118,527	20,451,296	78,087,979	10,463,853	13,627,591	1,788,896	22,593,992	1,825,301	50,299,633	27,788,346	.....	3,931,642	23,856,704	—1,516,030
Atlanta & West Point	93	550,160	412,003	1,076,941	152,015	224,207	51,587	338,764	45,829	812,402	264,539	1,863	68,661	197,741	—28,535
Atlanta, Birmingham & Atlantic	645	2,108,850	576,308	2,928,496	475,873	475,916	142,268	1,160,361	114,907	2,369,325	559,171	.....	143,368	415,803	31,335
Atlantic & St. Lawrence	167	995,334	309,098	1,419,699	220,377	217,943	43,667	675,653	43,121	1,200,761	218,938	.....	101,570	117,368	48,849
Atlantic City	167	628,391	1,169,413	1,902,443	376,878	135,162	26,636	976,556	13,894	1,529,126	373,317	—30,380	114,000	228,937	5,315
Atlantic Coast Line	4,681	20,799,379	7,836,596	30,925,944	4,234,826	4,973,386	542,470	10,878,000	1,022,559	21,651,241	9,274,703	—5,824	1,320,000	7,948,879	—948,599
Baltimore & Ohio—System	4,456	64,088,645	13,224,930	82,023,925	9,898,832	13,723,151	1,822,450	32,732,584	1,929,737	60,106,754	21,917,171	—762,528	2,772,389	18,382,254	—1,183,831
Baltimore & Ohio Chicago Terminal	77	.....	6,568	1,347,863	164,214	232,754	7,393	635,650	50,651	1,090,662	257,201	8,008	182,923	82,286	—53,394
Bangor & Aroostook	631	2,471,166	566,314	3,182,379	422,138	423,652	25,864	1,073,933	100,102	2,045,689	1,136,690	—1,095	96,378	1,039,217	373,613
Belt Ry. Co. of Chicago	21	.....	.....	2,548,479	243,802	263,580	5,999	1,020,048	63,976	1,597,405	951,074	.....	98,357	852,717	—27,887
Bessemer & Lake Erie	204	6,217,598	347,673	6,677,199	712,134	2,013,352	102,479	1,833,011	138,478	4,799,454	1,877,745	.....	300,000	1,577,745	—1,083,105
Bingham & Garfield	27	1,411,815	44,438	1,464,067	95,145	189,040	8,627	222,159	24,098	539,069	924,998	.....	29,565	895,433	398,073
Birmingham Southern	44	585,397	10,485	990,082	165,002	146,004	5,037	346,006	45,063	707,112	282,970	.....	21,410	261,560	—111,353
Boston & Maine	2,252	23,150,525	13,278,123	39,470,034	5,461,513	6,349,236	381,318	18,705,439	1,115,027	32,012,533	7,457,501	158,532	1,734,456	5,881,577	—930,310
*Buffalo & Susquehanna R. R. Corp'n	253	456,634	26,721	498,667	87,604	140,908	5,149	192,032	26,693	452,386	46,281	.....	10,400	35,881	.....
Buffalo & Susquehanna Railway	91	335,714	85,177	447,779	95,365	200,528	5,405	197,152	28,105	526,555	—78,776	—24	16,000	—94,800	38,914
Buffalo, Rochester & Pittsburgh	586	7,836,585	999,566	9,130,304	1,155,948	1,902,299	127,730	3,346,175	200,796	6,732,948	2,397,356	—1,996	186,000	2,209,360	—240,866
Butte, Anaconda & Pacific	91	1,017,515	125,151	1,246,758	145,634	210,503	6,407	440,664	37,969	841,177	405,581	.....	25,755	379,826	227,116
Canadian Pacific Lines in Maine	233	834,838	301,201	1,233,169	302,371	197,251	67,790	571,568	51,376	1,190,356	42,813	.....	110,000	—67,187	—154,049
Carolina, Clinchfield & Ohio	248	1,933,615	169,749	2,146,294	145,404	267,898	68,133	396,350	90,801	968,586	1,177,708	.....	112,500	1,065,208	—38,314
Carolina, Clinchfield & Ohio of S. C.	18	118,796	18,475	140,093	9,110	878	15,552	25,217	5,846	56,603	83,490	.....	7,500	75,990	—719
Central of Georgia	1,924	8,058,530	3,206,004	12,305,151	1,694,005	2,406,572	348,283	4,179,344	406,330	9,034,534	3,270,617	61,493	526,877	2,805,233	—18,762
Central of New Jersey	676	17,236,914	4,629,195	22,701,811	2,658,749	3,871,628	316,180	7,323,335	457,570	14,627,462	8,074,349	—44,959	1,112,470	6,916,920	—2,139,749
Central New England	304	2,617,424	382,687	3,151,487	425,316	379,228	13,088	1,111,659	45,717	1,975,008	1,176,479	—4,213	109,000	1,063,266	—317,082
Central Vermont	411	2,244,735	857,632	3,343,031	516,134	654,006	89,307	1,749,351	85,700	3,094,498	248,533	2,820	157,960	93,393	—330,376
Charleston & Western Carolina	341	1,396,911	332,682	1,810,244	321,521	287,901	34,183	682,508	48,489	1,374,602	435,642	.....	50,000	385,642	48,786
Chesapeake & Ohio Lines	2,347	24,102,921	5,058,189	30,534,030	3,294,898	6,511,233	552,225	10,125,284	763,486	21,247,126	9,286,904	15,642	1,145,794	8,156,752	578,022
Chicago & Alton	1,026	7,589,509	3,476,329	12,024,295	1,532,804	3,064,854	445,805	4,803,020	375,439	10,221,922	1,802,373	—32,238	463,100	1,307,035	—379,664
Chicago & Eastern Illinois	1,282	9,799,126	2,494,417	13,351,264	1,985,235	3,505,542	239,332	5,056,691	386,592	11,173,392	2,177,872	—24,198	516,700	1,636,974	—1,215,025
Chicago & Erie	270	3,629,321	578,906	4,633,250	876,741	1,116,568	214,920	2,473,243	131,528	4,863,000	—229,750	—33,084	147,016	—409,850	—309,229
Chicago & North Western	8,095	45,586,312	17,896,447	69,933,830	9,174,840	10,208,398	1,148,196	26,913,062	1,455,278	48,899,774	21,034,056	7,626	3,462,000	17,579,682	—345,365
Chicago, Burlington & Quincy	9,129	53,488,037	18,278,211	78,718,825	9,203,892	13,297,812	1,350,751	25,646,343	1,983,808	51,482,606	27,236,219	—150,950	3,049,361	24,035,908	—1,423,733
Chicago Great Western	1,496	8,386,243	2,703,830	12,012,382	1,679,653	1,946,613	478,121	4,592,251	360,012	9,056,650	2,955,732	—6,547	401,752	2,547,433	—263,603
Chicago, Indiana & Southern	359	3,283,992	263,022	3,662,309	528,049	1,154,640	89,246	1,335,221	103,382	3,210,538	451,771	2,810	168,867	285,714	—394,736
Chicago, Indianapolis & Louisville	617	3,872,929	1,414,173	5,797,009	857,118	917,703	193,800	2,206,436	165,826	4,340,883	1,456,126	.....	267,660	1,188,466	—143,901
Chicago Junction	12	.....	.....	1,712,880	169,676	171,276	11,356	917,360	45,476	1,315,144	397,736	88,486	25,854	460,368	—35,946
Chicago, Milwaukee & St. Paul	9,690	55,070,110	15,757,586	77,140,414	8,644,614	11,208,742	1,508,168	28,581,279	1,438,523	51,381,326	25,759,088	177,564	3,414,279	22,522,373	—1,161,791
Chicago, Peoria & St. Louis	255	1,056,385	269,669	1,408,970	276,542	339,089	65,577	698,409	52,503	1,432,120	—23,150	.....	54,700	—77,850	—117,570
Chicago, Rock Island & Gulf	477	1,670,212	545,827	2,399,758	291,692	309,764	96,161	977,696	79,399	1,754,712	645,046	—8,381	97,426	539,239	—438,738
Chicago, Rock Island & Pacific	7,845	35,857,530	15,309,216	54,712,413	6,907,686	7,784,026	1,515,074	22,964,509	1,575,695	40,746,990	13,965,423	—143,033	2,743,150	11,099,240	—695,414
Chicago, St. Paul, Minneapolis & Omaha	1,753	9,796,329	4,485,520	15,238,890	1,949,462	1,926,995	292,030	5,885,930	366,200	10,420,617	4,818,273	9,927	806,963	4,021,237	395,858
Chicago, Terre Haute & Southeastern	374	1,625,192	170,682	1,838,777	266,469	527,050	36,744	597,948	90,093	1,518,304	320,473	—2,674	115,000	202,799	—91,068
Cincinnati, Hamilton & Dayton	1,015	6,107,015	1,350,181	8,336,722	1,485,995	1,517,500	213,726	4,128,512	205,429	7,551,162	785,560	.....	362,861	422,699	—968,225
Cincinnati, New Orleans & Tex. Pac.	337	6,915,342	1,728,811	9,076,316	883,654	2,291,950	253,576	2,715,964	210,933	6,356,077	2,720,239	—8,622	306,000	2,405,617	—190,042
Cincinnati Northern	246	994,498	192,457	1,240,799	282,654	344,452	27,655	557,965	36,399	1,249,125	—8,326	.....	58,060	—66,386	—171,568
Cleveland, Cincinnati, Chic. & St. Louis	2,361	20,223,674	7,491,954	30,391,467	4,530,614	7,678,781	778,072	13,484,586	691,441	27,163,494	3,227,973	—16,698	1,222,668	1,988,607	—4,053,066
Colorado Midland	338	1,132,432	230,436	1,489,905	272,793	360,582	78,232	670,586	57,739	1,439,932	49,973	—4,907	88,000	—42,934	—153,102
Colorado & Southern	1,127	4,791,537	1,252,358	6,469,822	885,549	1,223,835	107,710	2,332,952	218,435	4,768,481	1,701,341	—8,566	334,071	1,358,684	—583,954
Cumberland Valley	162	2,186,999	585,785	2,900,254	563,711	346,135	51,174	1,014,113	85,512	2,060,645	839,609	1,074	60,976	779,707	—123,428
Delaware & Hudson—R. R. Dept	881	15,881,241	2,642,604	19,227,459	1,493,343	3,070,130	271,827	7,357,155	671,127	12,863,582	6,363,877	—7,784	548,107	5,807,986	—1,517,034
Delaware, Lackawanna & Western	960	23,668,140	7,067,224	32,941,535	4,047,705	5,153,869	723,851	10,499,367	702,179	21,126,971	11,814,564	353,627	1,730,000	10,438,191	—1,423,487
Denver & Rio Grande	2,585	14,446,764	4,314,888	19,625,041	2,817,517	3,630,910	416,968	6,209,981	530,444	13,605,820	6,019,221	—9,458	878,600	5,131,163	—573,659
Denver & Salt Lake	255	633,380	284,162	968,334	184,542	163,206	18,883	331,585	44,539	742,755	225,579	.....	41,000	184,579	—3,050
Detroit & Mackinac	411	664,666	286,031	1,016,821	114,234	161,187	24,160	375,170	26,925	701,676	315,145	20	87,622	227,543	—12,484
Detroit & Toledo Shore Line	79	1,337,216	.....	1,349,796	128,127	108,477	17,256	381,263	26,714	661,837	687,959	.....	55,431	632,528	110,933

*Figures shown here are for period January 1 to April 30, 1914.

REVENUES AND EXPENSES OF RAILWAYS

TEN MONTHS OF FISCAL YEAR ENDING JUNE 30, 1914—CONTINUED

Name of road.	Average mileage operated during period.	Operating revenues: Freight.	Passenger.	Total. inc. misc.	Operating expenses: Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Detroit, Grand Haven & Milwaukee	191	$1,273,967	$544,353	$2,119,837	$248,606	$320,906	$68,274	$1,168,378	$54,780	$1,860,944	$258,893	$808	$36,000	$223,701	$158,438
†Detroit River Tunnel	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Detroit, Toledo & Ironton	441	1,042,080	114,987	1,272,327	469,455	464,247	25,767	818,223	58,460	1,836,152	—563,825	.....	57,000	—620,825	—518,692
Duluth & Iron Range	292	4,885,318	247,171	5,231,401	711,126	650,031	11,259	1,316,677	146,229	2,835,322	2,396,079	—17,277	280,779	2,098,023	—216,380
Duluth, Missabe & Northern	363	5,552,638	322,437	5,946,342	965,954	881,181	23,019	1,315,112	148,683	3,333,949	2,612,393	13,938	336,847	2,289,484	—433,849
Duluth, South Shore & Atlantic	627	1,757,819	925,978	2,567,768	604,040	353,687	85,880	1,093,801	110,796	2,248,204	619,564	6,282	198,435	427,411	45,482
Duluth, Winnipeg & Pacific	181	1,243,722	240,545	1,510,918	235,020	276,386	22,360	568,583	57,530	1,159,879	351,039	.....	75,570	275,469	—34,992
El Paso & Southwestern Co.	1,030	6,103,164	1,030,883	7,464,494	1,074,887	1,034,798	165,468	2,127,896	259,757	4,662,806	2,801,688	—22,903	410,803	2,367,982	—299,366
Elgin, Joliet & Eastern	775	9,060,142	42	9,692,104	1,416,795	2,080,920	58,256	2,893,095	210,066	6,659,132	3,032,972	.....	357,889	2,675,083	—1,814,993
Erie	1,988	32,073,005	7,950,066	43,559,473	5,033,753	8,494,415	1,049,651	15,759,246	1,097,573	31,434,638	12,124,835	—293,739	1,540,352	10,290,744	—2,850,765
Florence & Cripple Creek	87	832,660	172,693	1,024,116	121,519	97,047	20,593	308,990	43,986	592,135	431,981	.....	56,848	375,133	—64,910
Florida East Coast	696	2,098,681	1,797,049	4,456,982	714,047	632,067	84,226	1,485,533	114,417	3,030,290	1,426,692	—12,959	200,000	1,213,733	59,748
Fort Worth & Denver City	454	2,639,834	2,136,109	4,088,971	492,669	625,673	70,461	1,685,295	157,667	3,031,765	1,057,206	—5,003	155,853	896,350	—428,633
Galveston, Harrisburg & San Antonio	1,338	6,748,088	2,696,269	9,995,035	1,287,493	1,862,487	342,763	4,202,898	348,184	8,043,825	1,951,210	—26,129	520,002	1,405,079	—519,587
Georgia	307	1,880,180	777,939	2,859,710	278,510	486,838	116,410	1,264,470	88,492	2,234,720	624,990	.....	27,482	597,508	294,881
Georgia, Southern & Florida	395	1,232,844	700,289	2,192,755	268,853	436,141	83,739	902,770	102,885	1,794,388	398,367	—1,110	113,855	283,402	—66,447
Grand Rapids & Indiana	575	2,747,468	1,582,856	4,670,926	637,983	750,621	124,533	2,071,069	158,813	3,743,019	927,907	—4,209	241,268	682,430	—103,487
Grand Trunk Western	347	3,791,102	1,831,782	5,981,008	670,933	1,109,730	222,927	2,832,866	182,086	5,018,542	962,466	—18,842	315,000	628,624	—589,909
Great Northern	7,804	46,278,402	12,832,975	63,462,436	9,387,785	8,335,719	1,118,822	17,901,781	1,177,925	37,922,032	25,540,404	113,600	3,724,420	21,929,584	—2,821,015
Gulf & Ship Island	308	1,260,897	331,769	1,702,151	227,911	334,226	29,459	474,239	85,468	1,151,303	550,848	130	75,215	475,763	78,454
Gulf, Colorado & Santa Fe	1,596	7,769,202	2,522,972	10,958,526	1,741,455	1,733,721	261,192	4,297,505	332,606	8,366,479	2,592,047	.....	507,247	2,084,800	—720,317
Hocking Valley	352	4,913,446	772,935	6,102,192	587,061	1,300,548	90,895	2,060,138	147,326	4,185,968	1,916,224	.....	399,600	1,516,624	—323,340
Houston, East & West Texas	191	810,905	338,451	1,216,820	190,349	129,612	18,989	516,445	41,420	896,815	320,005	.....	51,180	268,825	—7,422
Houston & Texas Central	789	3,720,826	1,537,187	5,650,393	905,920	816,691	145,215	2,609,954	183,265	4,661,045	989,348	—1,651	293,678	694,019	—386,381
Illinois Central	4,763	36,952,144	11,560,436	55,449,800	7,721,301	12,118,526	1,081,533	20,353,968	1,364,780	42,640,108	12,809,692	—13,205	2,753,000	10,043,487	1,090,818
Indiana Harbor Belt	105	.....	.....	2,719,240	366,873	340,297	28,953	1,310,174	78,023	2,124,320	594,920	21,000	63,541	552,379	—192,553
International & Great Northern	1,160	6,117,031	1,910,915	8,601,900	1,359,196	1,037,986	267,967	3,791,757	334,525	6,791,431	1,810,469	—16,905	289,841	1,503,723	—682,369
Kanawha & Michigan	177	2,321,393	316,497	2,701,229	366,773	622,214	29,088	830,657	69,969	1,918,701	782,528	—86	105,450	676,992	—155,753
Kansas City Southern	827	6,806,503	1,412,352	9,126,800	925,560	1,115,431	267,963	3,070,966	363,854	5,743,774	3,383,026	.....	434,084	2,948,942	—19,757
Lake Erie & Western	906	3,814,936	717,538	4,814,260	760,069	990,674	142,023	1,992,683	121,082	4,006,531	807,729	.....	219,640	588,089	—428,531
Lake Shore & Michigan Southern	1,854	28,890,290	10,769,318	44,949,179	5,800,982	10,639,541	859,284	16,355,375	976,836	34,632,018	10,317,161	32,580	2,016,212	8,333,529	—7,063,289
Lehigh & Hudson River	97	1,354,258	41,900	1,472,091	234,050	235,352	14,087	585,797	44,676	1,113,962	358,129	.....	40,000	318,129	—145,550
Lehigh & New England	291	1,642,925	11,843	1,720,539	223,714	234,578	19,937	473,868	39,501	991,598	728,941	.....	31,786	697,155	22,160
Lehigh Valley	1,442	27,462,491	3,976,860	32,645,514	3,801,373	5,951,523	824,876	11,831,262	788,767	23,197,801	9,447,713	—295,273	1,286,000	7,866,440	—2,350,913
Long Island	398	2,775,541	6,276,275	10,114,303	1,298,799	1,196,859	147,914	4,561,783	278,611	7,483,966	2,630,337	—17,656	647,170	1,965,511	—341,074
Louisiana & Arkansas	279	1,153,907	228,240	1,428,199	266,689	221,326	25,202	368,390	52,357	933,964	494,235	.....	55,073	439,162	—48,342
Louisiana Ry. & Navigation	351	1,298,909	242,350	1,645,471	311,520	196,856	61,488	679,099	68,006	1,316,969	328,502	.....	65,500	263,002	—102,320
Louisiana Western	208	1,235,158	616,704	1,945,734	205,056	416,351	74,100	623,043	66,328	1,384,878	560,856	—8,557	103,416	448,883	—99,182
Louisville & Nashville	4,923	36,481,387	11,023,987	50,652,946	7,803,275	10,285,582	1,096,283	17,338,210	1,058,191	37,581,541	13,071,405	23,217	1,801,359	11,293,263	—316,220
Louisville, Henderson & St. Louis	200	730,974	338,212	1,138,933	228,015	148,355	47,923	396,742	31,918	852,953	285,980	2,207	36,000	252,187	125,425
Maine Central	1,207	6,219,581	2,907,007	9,726,207	1,376,308	1,504,610	116,749	3,832,571	282,765	7,113,003	2,613,204	—37,645	493,779	2,081,780	—189,693
Michigan Central	1,800	18,388,998	7,655,852	28,822,651	3,933,095	5,078,803	636,865	12,687,533	570,282	22,906,578	5,916,073	—24,795	1,226,814	4,664,464	—2,921,180
Midland Valley	373	898,626	407,883	1,381,494	310,830	262,089	24,588	497,263	63,029	1,157,799	223,695	1,176	65,605	159,266	—24,121
Minneapolis & St. Louis	1,586	6,054,356	1,616,759	8,132,530	1,083,400	1,149,080	176,763	3,151,826	199,653	5,760,722	2,371,808	—405	340,315	2,031,088	—251,148
Minneapolis, St. Paul & Sault Ste. Marie	4,065	17,420,759	5,667,709	24,540,867	2,897,510	3,756,543	535,642	8,131,066	535,807	15,856,568	8,684,299	105,573	993,186	7,796,686	—2,688,507
Missouri & North Arkansas	365	678,049	353,347	1,099,627	278,542	208,907	36,857	441,777	56,702	1,022,785	76,842	.....	55,000	21,842	36,787
Missouri, Kansas & Texas System	3,817	17,417,742	7,738,138	27,014,312	3,992,399	3,381,742	618,289	10,533,157	1,010,283	19,535,870	7,478,442	—98,592	1,267,821	6,112,029	—1,300,441
Missouri, Oklahoma & Gulf	332	772,927	210,105	1,023,222	223,739	169,121	53,565	494,003	70,321	1,010,749	12,473	3,964	61,385	—44,948	—97,504
Missouri, Oklahoma & Gulf Ry. Co. of T.	19	99,184	5,418	106,181	12,936	16,249	1,823	54,805	8,283	94,096	12,085	.....	1,999	10,086	9,823
Missouri Pacific	3,920	16,529,392	4,029,174	22,459,336	3,446,692	4,171,114	575,521	9,563,976	688,323	18,445,626	4,013,710	—34,685	970,822	3,008,203	—647,143
Mobile & Ohio	1,122	8,900,736	1,278,854	10,810,122	1,263,254	2,212,366	416,192	4,141,119	333,659	8,366,590	2,443,532	—14,845	348,772	2,079,915	—299,782
Monongahela	67	1,183,005	27,809	1,230,303	147,055	71,088	4,049	255,227	21,651	499,070	731,233	.....	23,000	708,233	—115,384
Monongahela Connecting	6	.....	.....	819,557	82,604	147,223	3,000	397,326	26,029	656,182	163,375	.....	27,069	136,306	—74,156
Morgan's La. & Tex. R. R. & S. S. Co.	405	2,704,385	982,429	3,991,196	524,427	618,997	120,919	1,643,653	129,840	3,037,836	953,360	—13,614	242,038	697,708	236,480
Nashville, Chattanooga & St. Louis	1,231	7,444,131	2,572,777	10,791,490	1,680,289	2,053,279	425,120	4,095,845	322,292	8,576,825	2,214,665	—8,252	265,580	1,940,833	—279,492
Nevada Northern	165	1,315,245	123,169	1,472,835	169,686	195,859	4,451	345,634	48,352	763,982	708,853	.....	76,413	632,440	3,543
New Orleans & North Eastern	204	2,558,163	540,586	3,340,054	345,634	728,922	101,792	1,265,694	130,954	2,572,996	767,058	—3,819	153,963	609,276	6,093
New Orleans Great Northern	283	1,119,726	327,618	1,574,744	211,337	176,187	26,665	450,687	75,946	940,822	633,922	—799	26,923	606,200	53,887
New Orleans, Mobile & Chicago	403	1,445,989	311,284	1,862,701	267,901	215,781	38,644	597,460	79,848	1,199,634	663,067	—943	73,233	588,891	4,859
New Orleans, Texas & Mexico	286	1,081,007	181,870	1,344,678	413,488	128,709	33,802	533,080	90,689	1,199,768	144,910	.....	12,546	132,364	—142,726
New York Central & Hudson River	3,756	54,937,392	28,996,033	94,321,707	13,443,749	19,138,108	1,808,798	35,786,895	2,488,801	72,666,351	21,655,356	—208,474	5,087,107	16,359,775	—4,386,099
New York, Chicago & St. Louis	566	5,317,277	1,327,825	9,980,787	1,250,433	1,607,139	489,501	4,647,667	191,884	8,186,624	1,794,163	—27,886	383,213	1,383,064	—1,107,863

†Merged with Michigan Central January 1, 1914.

Traffic News

The executive committee of the American Association of Traveling Passenger Agents has decided to hold the next meeting of the association in San Francisco, October 8 to 11.

The Adams Express Company has taken the contract to do the express business on the Delaware, Lackawanna & Western, beginning July 1, when the United States Express Company goes out of business. The Adams company will send business through to Chicago over the Lake Shore & Michigan Southern.

The Central Traffic Bureau has been organized by various commercial organizations in New Orleans to replace the freight and transportation bureau of the Board of Trade. It will represent the Board of Trade, the Cotton Exchange, the Association of Commerce, and the New Orleans Steamship Association.

The Interstate Commerce Commission has indorsed the code of storage rules recently adopted by the American Railway Association and the National Industrial Traffic League, and has recommended that it be made effective, subject to the right of inquiry by the commission into the reasonableness and legality of any rule that may be made the subject of complaint.

E. S. Walsh, manager of the Syracuse & New York Canal Line, says that the railroads which own canal boats have taken their lines off from the Erie canal, and in addition have ordered their lake lines to refuse to accept freight from the independent canal carriers, at Buffalo, except at local rates, which are declared to be prohibitive.

The Southern Classification Committee has announced that owing to the intervention of important rate matters which will require the individual attention of certain members of the committee, the meeting of the Southern Classification Committee scheduled to be held at the St. Charles Hotel, Atlantic City, on July 6, has been postponed. No date has yet been set for the holding of the next meeting, but it will be announced later.

The Chicago & North Western announced last week that it would immediately file a new tariff of class rates from Sioux City to interior Iowa points, and points in Nebraska, Wyoming and South Dakota, to conform to a recent order of the Interstate Commerce Commission effective June 1. The Chicago, Milwaukee & St. Paul and Chicago, Burlington & Quincy have already filed their tariffs. The North Western announced that overcharges from June 1 to the date of the new tariffs would be refunded.

An informal conference of the chief traffic officers of the southwestern lines, was held last week in St. Louis, to consider the relation between the trunk lines and the tap lines as affected by the recent decision of the Supreme Court. Several tap lines made application for regular divisions, but the trunk line officials reached the conclusion that the whole situation awaits an expression or ruling from the Interstate Commerce Commission, defining the basis or proper amount of the division, and until the commission is heard from, nothing will be done.

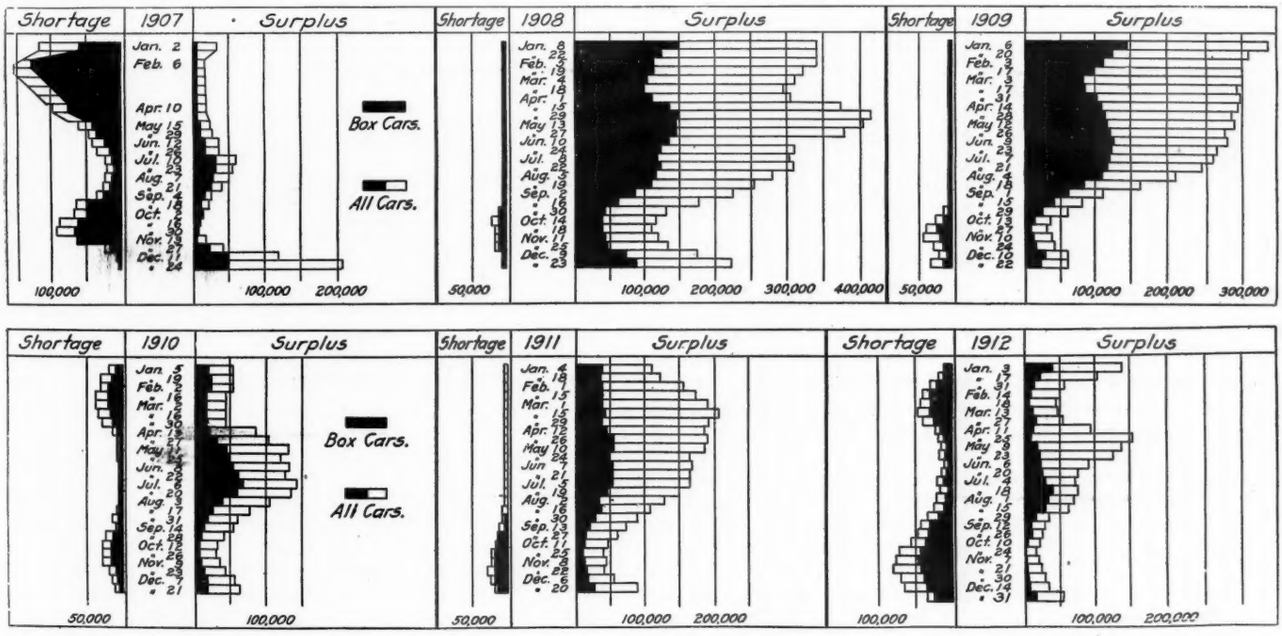
Traffic Club of Pittsburgh

The Traffic Club of Pittsburgh, at its annual election, on June 8, elected the following officers: President, Edward F. Lalk, general agent, Atchison, Topeka & Santa Fe; first vice-president, William H. Higgins, traffic manager, Wheeling Steel & Iron Company; second vice-president Milton H. Jacobs, assistant general freight agent, Western Maryland; board of governors: Transportation—Geo. H. Kerr, general agent, Southern; John E. Corfield, general agent, Union Pacific, and Ralph B. Merrick, general agent, St. Louis & San Francisco. Industrial—Glen A. Aiken, traffic manager, Spang, Chalfant & Company, Inc.; Alfred R. Kennedy, traffic manager, Pittsburgh Steel Company. D. L. Wells, general agent, Erie, and Jas. T. Neison, commercial agent, Missouri Pacific, were re-elected secretary and treasurer respectively.

Car Surpluses and Shortages

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association, in presenting statistical bulletin No. 169, giving a summary of car surpluses and shortages by groups from February 1, 1913, to June 1, 1914, says:

"A further small increase in surplus cars brings the largest surplus since 1909. The total surplus on June 1, 1914, was 242,572 cars;



Car Surpluses and Shortages, 1907 to 1914

on May 15, 1914, was 239,406 cars; on May 31, 1913, was 60,291 cars; on June 6, 1912. was 89,208 cars; on June 7, 1911, was 169,006 cars; and on June 8, 1910, was 129,508 cars.

There is some reduction in the coal car surplus, particularly in central freight association territory (group 3). The total shortage on June 1, 1914, was 770 cars; on May 15, 1914, was 764 cars; on May 31, 1913, was 9,383 cars; on June 6, 1912, was 2,822 cars; on June 7, 1911, was 2,204 cars, and on June 8, 1910, was 3,011 cars. The shortage remains merely nominal.

CAR SURPLUSES AND SHORTAGES

Date	No. of roads.	Surpluses: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—June 1, 1914	8	1,283	404	1,633	570	3,890	0	7	0	0	7
" 2.— " 1, 1914	27	5,437	305	18,452	9,874	34,068	0	0	0	0	0
" 3.— " 1, 1914	27	8,811	1,127	45,689	5,258	60,885	40	200	0	6	246
" 4.— " 1, 1914	11	6,886	1,022	3,645	1,141	12,694	50	0	0	3	53
" 5.— " 1, 1914	20	4,229	732	10,761	2,327	18,049	100	0	0	0	100
" 6.— " 1, 1914	26	15,590	702	8,311	7,340	31,943	5	71	6	4	86
" 7.— " 1, 1914	4	5,072	160	2,142	3,534	10,908	0	0	0	0	0
" 8.— " 1, 1914	15	8,675	187	1,497	4,396	14,755	0	0	0	0	0
" 9.— " 1, 1914	12	1,438	154	226	1,830	3,648	8	0	0	0	8
" 10.— " 1, 1914	23	15,093	1,814	2,414	11,280	30,601	0	0	1	0	1
" 11.— " 1, 1914	3	17,622	968	0	2,541	21,131	250	19	0	0	269
Total	176	90,136	7,575	94,770	50,091	242,572	453	297	7	13	770

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin and Minnesota lines; Group 7—Montana, Wyoming, Nebraska, North Dakota and South Dakota lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Washington, Oregon, Idaho, California, Nevada and Arizona lines; Group 11—Canadian lines.

The Iron Mountain in New Orleans

The St. Louis, Iron Mountain & Southern has entered into an agreement with the Texas & Pacific providing for an entrance into New Orleans, La., over the tracks of the T. & P. The Iron Mountain also secures a proprietary interest in the terminals of the Texas & Pacific on both sides of the river, and the docks owned by the Texas Pacific. Under the arrangement the Iron Mountain will have an equal interest with the Texas & Pacific in the Trans-Mississippi Terminal Company, which is to operate all of the Texas & Pacific terminals in New Orleans and on the opposite side of the river, including the territory as far as Westwego, about nine miles up stream from New Orleans. The Iron Mountain, under the arrangement, is to jointly operate with the Texas Pacific, the line from Alexandria to New Orleans, a distance of 194 miles, as soon as proposed improvements in the way of new passenger and freight stations, and additional yards and other facilities have been completed by the terminal companies. This will enable the Iron Mountain to run through trains between St. Louis and New Orleans.

Salt Lake City Commercial Club Aroused by Anti-Railroad Agitation

The action of the Salt Lake City Commercial Club Traffic Bureau, mentioned in last week's issue of the *Railway Age Gazette*, in asking Governor Spry of Utah to order an investigation of the Union Pacific's declaration of an extra dividend of cash and Baltimore & Ohio stock, seems to have stirred up a big commotion among the membership of the Salt Lake City Commercial Club, with which the traffic bureau is no longer officially connected, in spite of the similarity of names. Seventy-five prominent members of the club held a meeting on June 8, and addressed a communication to the board of governors of the Commercial Club, calling upon the board to repudiate the action of the traffic bureau, and to declare officially that the action of the bureau was not representative of the business sentiment of the city or the state, but was distinctly detrimental to the best interests of the state in its future well-being. The board of governors of the club later adopted a resolution declaring that the traffic bureau was an independent corporation, and in no sense subsidiary to, or controlled by, the commercial club, and therefore, the board declared it was not in a position to approve or disapprove the petition to the governor.

Although the club was responsible for the organization of the traffic bureau, the bureau has always been a separate and distinct corporation, with separate membership and conducting its own organization. During the meeting a telegram from R. S. Lovett, fully explained the Union Pacific dividend, and answered the charge, made by the traffic bureau, was read.

Commission and Court News

INTERSTATE COMMERCE COMMISSION

Oral arguments were heard before the Interstate Commerce Commission at Washington, June 5, in connection with the investigation of private car lines.

A large delegation of dry goods merchants from St. Louis, Kansas City, St. Joseph, Omaha, Sioux City, Minneapolis and other western cities, appeared before Examiner W. J. Wood of the Interstate Commerce Commission at Chicago, on June 10, to protest against the proposed advance in rail and lake rates on knit goods from trunk line territory to Chicago and the west. The advance proposed is from 44 cents to 50 cents per 100 lb. The tariff has been suspended by the commission pending an investigation.

Examiner W. J. Wood of the commission held a hearing in Chicago, on June 9, on the complaint of the Cudahy Packing Company against the Atchison, Topeka & Santa Fe and the Southern Pacific, seeking the application of the fifth class rate as a maximum on packing house products from the Missouri river to common points in Utah. Swift & Company also filed an intervening petition becoming a party to the complaint. The application of the fifth class rate means the reduction from $1.05 to $.98. L. T. Wilcox, attorney for the Southern Pacific, announced that the railroads had published a tariff embodying the 98 cent rate, but the tariff was suspended by the commission because it contained other advanced rates.

Switching Charges

Switching Charges at Arcade, N. Y. Opinion by Chairman Harlan:

Tariff of the Buffalo, Attica & Arcade Railroad, which proposes to withdraw its switching charges on traffic handled by the Buffalo & Susquehanna to and from industries on the line of the Buffalo, Attica & Arcade, at Arcade, N. Y., ordered to be canceled. The tariff now in effect provides for a charge of $3 per car for this service, which is absorbed by the Buffalo & Susquehanna. The cancellation of the switching tariff would leave no rates in effect between the industries affected and the Buffalo & Susquehanna Railway and a protest was therefore made by certain shippers.

The position of the respondent, as expressed in its brief, is that it has no desire to sever connections with the Buffalo & Susquehanna, but vigorously resents being used as a terminal for the Buffalo & Susquehanna and being deprived of its legitimate revenues by that company by reason of the advantages which the switching arrangement affords to it. The Buffalo & Susquehanna was not made a party to this proceeding.

An exhibit was introduced showing that the operations of the Buffalo, Attica & Arcade are conducted annually at a deficit, and it is urged that this condition is brought about largely through the operation of the switching arrangement which

denies it the opportunity of participating in the incoming and outgoing traffic on the basis of a division of the rate. The real controversy here is one between carriers and involves the question as to what would constitute a reasonable return to the respondent for the use of its Arcade terminals by the Buffalo & Susquehanna, a matter in which the protestant is not at all interested. Although, as has been said, the latter carrier was not a party to this proceeding, its opposition to entering into any joint arrangement which would require it to shrink its revenue beyond the present amount of $3 a car is clearly defined of record.

Upon full consideration of all the facts appearing of record we find nothing which to our mind justifies an increase in the charges to the shippers in Arcade such as would result from withdrawal of the application of the Arcade rates to and from the industries on the line of the respondent, and for that reason we can not give our approval of the proposed tariff. In taking this course we do not mean to be understood as now expressing the definite and final conclusion that the present Arcade rate is the proper rate for those industries to pay; the real controversy, as heretofore indicated, is one of divisions as between the respondent and the Buffalo & Susquehanna. In our judgment that question can not well be determined except upon a record to which the Buffalo & Susquehanna is a party. We suggest a conference between the respondent and the Buffalo & Susquehanna with respect to this controversy, and in the event of their failure to reach an agreement the matter can be brought to our attention. For the present our order will go no further than to require the respondent to withdraw the tariff canceling the switching charges. (30 I. C. C., 501.)

Louisville & Nashville Fertilizer Rates Approved

Meridian Fertilizer Factory v. Louisville & Nashville et al. Opinion by the commission:

Rate of $3.56 per net ton for the transportation of phosphate rock from Mount Pleasant and Centerville, Tenn., to Shreveport, La., not found to be unreasonable or unduly prejudicial. Complaint dismissed. (30 I. C. C., 494.)

High Fares O. K. on a Poor Road

Railroad Commission of Arkansas v. Missouri & North Arkansas R. R. et al. Opinion by Commissioner Clements:

Interstate passenger fares are higher on one road than fares charged by other carriers in the same general territory and higher than intrastate fares fixed under authority of state laws and not voluntarily accepted by the carrier, but this is not sufficient to justify an order reducing such fares when the carrier making such charge is operating through a mountainous and sparsely settled country and is earning less than its taxes and cost of operation.

It is not proof of extravagance that such carrier, operating through such territory and having a roadbed upon which there are sharp curves and steep grades, has a higher operating expense than another carrier in the same general territory having no such transportation difficulties.

A passenger fare of 6½ cents a mile for that part of a railroad 12.37 miles long which runs through a mountainous and thinly populated country, the total earnings of the whole road being insufficient to pay operating expenses and taxes, is not, under all the circumstances shown here, unreasonably high.

That the aggregate of intermediate fares prescribed by state authority and not voluntarily accepted or used in making the interstate fare, is less than the through interstate fare shows no violation of the act to regulate commerce. (30 I. C. C., 488.)

Rates on Bananas from New Orleans

In Topeka Traffic Association v. Alabama & Vicksburg, 27 I. C. C., 428, the commission held that the maintenance of higher rates by defendants for the transportation of bananas in carloads from New Orleans, La., and Galveston, Tex., to Topeka, Kan., than they contemporaneously maintained and charged to Lincoln and Beatrice, Neb., was unjustly discriminatory against Topeka, and defendants were required to remove the discrimination. To comply with the commission's order defendants proposed to increase the rates from the points named to Lincoln and Beatrice. The proposed increased rates having been suspended and a general investigation having been made into the rates on bananas from gulf ports to points in Nebraska and Kansas. *Held:* 1. That carriers have not justified the proposed increased rates from New Orleans, La., and Galveston, Tex., to Lincoln and Beatrice, Neb., and that the schedules under suspension should be canceled. 2. That the rate from New Orleans to Topeka, Kan., should not exceed the rate from New Orleans to Kansas City, Mo., by more than 8 cents per 100 lb., and should not be higher than the rate contemporaneously charged from New Orleans to Lincoln or Beatrice, Neb. 3. That the rates from New Orleans to Hutchinson and Wichita, Kan., should not exceed the rate contemporaneously in effect from New Orleans to Topeka. (30 I. C. C., 510.)

Chicago & Northwestern Coal Rate Approved

American Coal & Supply Company v. Chicago & North Western et al. Opinion by Chairman Harlan:

Defendants' through charges for the transportation of soft coal from Indiana mines to Terra Cotta, Ill., via Chicago, found on the facts of record not unreasonable. Complaint dismissed. (30 I. C. C., 492.)

Higher Rates Permitted

California-Colorado Lumber Rates. Opinion by Chairman Harlan:

From the facts of record herein it appears that the respondents have justified the increase in rates in question. As the Southern Pacific rates have already become effective, no order will be made as to that carrier; but as the Santa Fe rates are still under suspension, an order of vacation will be issued. (30 I. C. C., 461.)

STATE COMMISSIONS

The Louisiana Railroad Commission has addressed a memorial to the Louisiana legislature, asking the extension of its authority to include regulation of street railways, gas, electric light and canal companies.

The Michigan Railroad Commission concluded the taking of evidence in the hearings on the proposed 5 per cent. advance in freight rates in the state on June 10. The shippers were given until July 15 to file briefs, and the railroads until August 1 to file their reply.

The Kansas Public Utilities Commission has issued an order for general investigation of all joint, class and commodity freight rates, and a hearing is to be held on June 23. Complaints from jobbers in Topeka, Wichita, Atchison and other jobbing centers occasioned the investigation.

The State Railroad Commission of Georgia has prescribed new tariffs for the transportation of merchandise by express in that state, using the "block" scheme of rates which has been prescribed by the Interstate Commerce Commission for interstate express traffic. On articles of food and drink, and also on nearly or quite all articles transported short distances the new tariff will make reductions.

The Illinois Public Utilities Commission held a hearing last week in Chicago, on the complaint of the American Sand & Gravel Company and others, against the Chicago Switching Committee and 29 railroads entering Chicago, asking a reduction of the switching charges on sand and gravel in the Chicago switching district. The protest is directed against what is known as the Lowrey tariff.

Richmond Dean, general manager; G. S. Fernald, general attorney; F. S. Hungerford, general superintendent, and H. K Clements, general ticket agent, of the Pullman Company, appeared before the California Railroad Commission last week at San Francisco to present additional evidence in a case in which the commission recently ordered a revision of the rules and practices of the company, and censured the company for paying its porters such low wages as to compel them to depend upon tips. Mr. Dean said it was impossible to do away with tips.

The Missouri Public Service Commission has ordered the Sligo & Eastern, which operates about 30 miles of line through Dent, Crawford, Iron, Washington and Reynolds counties, Missouri, to run trains over its entire line as a common carrier, and to file tariffs with the commission. A part of the road has been operated as a private line, serving a timber country, and certain shippers have claimed that they were discriminated

against by the regulations of the road, which forced them to sell to a certain manufacturer. They want an opportunity to sell their timber in the general market.

The Illinois Public Utilities Commission held a hearing in Chicago on June 10 and 11, on the application of the Illinois Northern for an order requiring the trunk line railroads to continue to pay it an allowance in the form of a division of the through rate. The road is controlled by the International Harvester Company. F. B. Montgomery, traffic manager of the Harvester Company and president and general manager of the railroad, testified that of the shipments over the road in the calendar year 1913, only 2.8 per cent. was business of the Harvester Company, and that if the joint rates were canceled the additional cost to shippers would be $258,775,

The Louisiana Railroad Commission has announced that a hearing will be held on a date to be set later, to consider a petition filed by the New Orleans Board of Trade, asking for a hearing on the question of what points in the state shall be considered as common, junction, or basing points, used in the making and construction of through rates. A definition by the commission of such points is said to be necessary in view of the fact that some of the railroads are eliminating from consideration as junction, common or basing points, certain points which by virtue of the general rate adjustments they carry and by reason of their locations are claimed to be essentially common or basing points as to all intrastate rates.

The Montana Railroad Commission has issued an order rescinding its former order directing a general reduction of distributing rates throughout the state. In the opinion the commissioners refer to the fact that the complainants, with few exceptions, have failed and even refused to give the commission their testimony and support. A re-hearing of the case was held at the petition of the carriers. Meanwhile, the railroads put into effect tariffs making a number of reductions in the rates involved in the commission's order. Since the re-hearing, the commission says its office has been the recipient of dozens of petitions and resolutions from all parts of the state, expressing the hope that freight rates will not be further reduced at this time, but that the commission accept what the railroads have voluntarily offered.

The Missouri Public Service Commission has issued its first annual report on the inspection of steam and electric railways made by the commission for the purpose of determining whether the general condition of the roads is such as to give safe and adequate service to the traveling public. The inspections were made by Commissioner F. A. Wightman, accompanied by an engineer of the commission, and engineers and operating officers of the railroads. In general, the method of making these inspections was to have an inspection car pushed in front of the engine at an average speed of about 20 miles an hour. In cases where complaints had been made to the commission, and in other special instances, the train was stopped and the inspection was made on foot. Circular letters were sent out to the railroads in advance asking for concise statements, giving statistical data regarding the physical properties. As the work of organizing the engineering department of the commission was not completed until September, not all of the roads were inspected, but out of 11,279 miles of steam railroads, 3,594 miles were inspected. The report gives a detailed account of each inspection, and states in detail the results of the observation, whether in the form of praise or censure. As the result of the inspection about 50 track miles of rail is being relaid, crossing protection has been recommended in the case of 32 crossings, and crossing planks and grading of approaches has been ordered in a number of cases. A large amount of ballasting and draining has also been recommended and increased facilities at stations in a number of cases have been obtained. Next year it is the intention of the commission to inspect all track in the state.

COURT NEWS

In the United States District Court at New York City last week a liquor dealer was fined $25 for shipping a jug of whiskey, seven gallons, billed as "groceries."

Seven of the nine railroads which began action in the district court at Des Moines, Iowa, in 1910, to prevent the enforcement of lower rates on coal ordered by the Iowa Railroad Commission, have had their cases dismissed.

The St. Louis & San Francisco, and the Kansas City, Fort Scott & Memphis have announced their intention of contesting the validity of the Kansas corporation tax law, by filing an appeal to the supreme court of the state from the district court of Shawnee county.

The Supreme Court of the United States has sustained the Court of Appeals of Georgia in a decision upholding the law of that state requiring headlights of certain power on locomotives. It is held that until Congress shall take action on this subject the state of Georgia has full right to pass a regulative law.

The Northern Pacific Terminal Company has filed suit in a court at Salem, Ore., asking the vacation of an order of the state railroad commission preventing it from granting baggage privileges to the Baggage & Omnibus Transfer Company of Portland. The commission had issued an order forbidding the terminal company to discriminate in favor of any transfer company, after complaints had been filed with the commission by other baggage and transfer companies on the ground that the Baggage & Omnibus Transfer Company was given special privileges at the Union Depot.

The Department of Agriculture announces that four railroads have been fined for violating the twenty-eight-hour live stock and the quarantine laws, as follows: Atchison, Topeka & Santa Fe (12 cases), $1,600; Receivers of the Kansas City, Mexico & Orient (3 cases), $300; Chesapeake & Ohio, $100; Receivers of the St. Louis & San Francisco, $100. All these under the law regulating rest and feeding. For violations of the quarantine law, six cases were recently terminated against the St. Louis, Iron Mountain & Southern, in each of which the company was fined $100 and costs. The St. Louis Southwestern was also fined $100 and costs in each of three cases for violations of the quarantine law.

Judge Weir of the Superior Court of Indianapolis, Ind., has rendered a decision in the case of a traveling auditor for the Chicago & Eastern Illinois, who was injured in an accident on the Wabash in 1912. He was riding on a pass which contained on the back the usual notice that the holder assumed all risk of damage for personal injury, and when he sued the receiver of the road for damages, the receiver held that on account of the statement on the pass the Wabash was not liable. The court holds, however, that as the Wabash and Chicago & Eastern Illinois exchanged passes for their employees it could not be held that the injured man was riding for nothing, and that the Chicago & Eastern Illinois had in reality paid for the use of the pass, and that he was therefore entitled to bring an action for damages for personal injury.

Developing Agricultural Traffic in France.—The railways of France have taken particular pains to develop agricultural traffic, including such special branches of the business as the transportation of choice fruit and flowers from the Riviera. The matter is of particular importance to the French railways, since the failure of the harvest, whether it be in the vineyards or the cereal districts, is immediately reflected in the annual reports. The Orléans Company has made special efforts in this direction, and its enterprise is of the kind more associated on the whole with American than with European railways. For instance, the company is now busily engaged in developing the asparagus traffic, and is waging an active campaign in the valleys of the Lot, the Tarn and the Dordogne. Special trains are used for the conveyance of the asparagus. The effect of this propaganda can be realized from the fact that the amount carried to Paris almost doubled in amount between 1903 and 1912. The Orléans leaves no stone unturned in its endeavors to develop agricultural traffic of all kinds. It has despatched numerous commercial missions not only throughout France, but also to foreign countries, and has organized exhibitions and competitions in France and abroad. By virtue of its geographical situation, the line is particularly dependent on traffic of the kind, and its development during the last few years has been really remarkable. This shows, at least, manifestation of the truth, that in doing well for itself, a railway company must inevitably benefit the districts which it serves.

Railway Officers

Executive, Financial, Legal and Accounting

The headquarters of R. M. Huddleston, general auditor of the New York Central Lines west of Buffalo, will be removed from Chicago to New York on July 1.

Operating

O. H. Wadleigh has been appointed trainmaster of the Nevada-California-Oregon, at Reno, Nev.

J. E. Roberts has been appointed superintendent of car service of the Delaware & Hudson, with office at Albany, N. Y.

T. J. Worthman, general agent of the American Express Company at Omaha, Neb., has been appointed superintendent of the Iowa division, with office at Des Moines, Iowa.

James Flynn, trainmaster of the third and fourth districts of the first division of the Denver & Rio Grande, has been appointed assistant superintendent of the third division, with office at Gunnison, Colo.

F. W. Bradt has been appointed assistant trainmaster of the Susquehanna division of the Delaware & Hudson, succeeding M. W. Sullivan, whose new appointment has previously been announced in these columns.

F. L. Richards, chief train despatcher of the Chicago, Milwaukee & St. Paul at Perry, Iowa, has been appointed trainmaster at Savanna, Ill., in place of W. P. Moran, resigned. J. M. Losey succeeds Mr. Richards. F. D. Campbell, chief train despatcher at Miles City, Mont., has been appointed trainmaster at Mobridge, S. D., to succeed W. C. Ennis, transferred. A. O. Veitch succeeds Mr. Campbell.

Frederick M. Woodall, whose appointment as superintendent of the Atlanta, Birmingham & Atlantic, with office at Manchester, Ga., was previously announced in these columns, was born June 10, 1872, in Fairburn, Ga. After a common school education he began railroad work in April, 1887, on the Atlanta & West Point as brakeman. Up till 1900 he had worked as brakeman, baggage master and conductor, and in that year went to the Central of Georgia as yard foreman, and was later made general yardmaster. In 1905 he was transferred to Macon, Ga., as general yardmaster, and was promoted to trainmaster of the Macon division May 1, 1907. In 1908 he was appointed terminal trainmaster of the Atlanta joint terminals. He was later made trainmaster of the Brunswick division, and subsequently trainmaster of the Birmingham division, which position he held up to June 1, when he was appointed superintendent.

Arch E. Campbell, whose appointment as superintendent of the Columbia division of the Chicago, Milwaukee & St. Paul, with headquarters at Malden, Wash., has already been announced in these columns, was born January 5, 1875, at Onargo, Ill. He was educated at the Kansas State College, 1889 to 1891, and at Washburn College, Topeka, Kan., 1891-1892, and began railway work in August, 1892, as file clerk in the general superintendent's office of the Chicago, Rock Island & Pacific at Topeka. He remained with the Rock Island for 14 years, filling various positions, including that of chief clerk to the general manager at Chicago, resigning the latter position in 1906. Mr. Campbell entered the service of the Chicago, Milwaukee & St. Paul in January, 1907, being employed in the engineering department. He was transferred to the superintendent's office at Seattle, Wash., as chief clerk in July, 1908, and in April, 1910, was appointed trainmaster at Miles City, Mont. On February 1, 1913, he was made trainmaster of the Coast division at Tacoma, which position he held at the time of his recent promotion to division superintendent, as above noted.

Traffic

T. J. Keen has been appointed commercial agent of the Texas & Pacific at Texarkana, Tex.

Max V. Beckstedt has been appointed freight solicitor of the Delaware & Hudson at Albany, N. Y.

Arthur B. Huff has been appointed industrial commissioner of the Erie, with office at 50 Church street, New York.

M. C. Finkle has been appointed traveling freight agent of the Carolina Despatch, at Cincinnati, Ohio, succeeding B. S. Fay, promoted.

H. H. Hamill has been appointed commercial agent at Detroit, Mich., of the Grand Trunk, succeeding James McPeak, granted temporary leave of absence.

H. L. Hudson has been appointed district freight and passenger agent of the Oregon-Washington Railroad & Navigation Company at Lewiston, Idaho, succeeding A. MacCorquodale, resigned.

E. D. Perkins, chief clerk in the traffic department of the Pacific & Idaho Northern and the Central Idaho Telephone & Telegraph Company, has been appointed assistant traffic manager of both companies, with office at New Meadows, Idaho.

George E. Bates, division freight and passenger agent of the Delaware & Hudson at Scranton, Pa., has been appointed industrial agent, with office at Albany, N. Y. John J. Coyle, general eastern freight agent, succeeds Mr. Bates, and C. E. Rolfe, general freight agent, will assume the duties of general eastern freight agent.

C. L. Lyons, commercial agent of the Missouri, Kansas & Texas, at St. Louis, Mo., has been appointed assistant general freight agent at that place, and L. W. Mosher, commercial agent at Oklahoma City, Okla., succeeds Mr. Lyons. Mr. Mosher is succeeded by O. C. Thomas, commercial agent of the Wichita Falls & Northwestern, at Wichita Falls, Tex.

Engineering and Rolling Stock

S. Hickson has been appointed roadmaster of the second district of the Oregon-Washington Railroad & Navigation Company, with office at Colfax, Wash., succeeding T. Keaveny, resigned.

H. B. Shoemaker, roadmaster of the Lake Shore & Michigan Southern at Dunkirk, N. Y., has been appointed engineer maintenance of way of the Chicago, Indiana & Southern, with headquarters at Gibson, Ind., succeeding M. C. Cleveland, resigned.

K. K. Kuney has been appointed locating engineer on the government railway surveys in Alaska. Mr. Kuney has been assistant engineer on the Great Northern, being in charge of the extensive snowshed construction in the Cascade mountains during the past year.

George W. Hand, whose appointment as valuation engineer of the Chicago & North Western, with headquarters at Chicago, has already been announced in these columns, was born December 11, 1882, at Huntertown, Ind. He was educated at Purdue University, and began railway work September 1, 1903, with the Chicago & North Western, with which road he has been employed continuously on location, construction, maintenance and special work in the general office. For two years of this time he was employed on track elevation work in Chicago. Since 1907 Mr. Hand has attended to all of the company's valuation work for the states that have required appraisals.

A. F. Dorley, superintendent of water service of the Missouri Pacific, has been appointed principal assistant engineer, with headquarters at St. Louis, Mo. J. A. Lahmer has been appointed assistant engineer at St. Louis. F. Neher, assistant engineer on construction, has been appointed assistant engineer in the maintenance of way department at St. Louis. R. H. Hallstead, assistant engineer at Little Rock, Ark., has been transferred to Kansas City, Mo. W. R. Luhn, assistant engineer at Wichita, Kan., has been transferred to Coffeyville, in place of R. E. Warden, who has been transferred to Atchison, Kan. P. V. Sherman, assistant engineer at Falls City, Neb., succeeds Mr. Luhn. P. T. Simons, assistant engineer at St. Louis, succeeds Mr. Hallstead, and E. Sullivan, assistant engineer at Kansas City, takes the place of Mr. Sherman.

Harvey Shoemaker, whose appointment as mechanical superintendent of the Bangor & Aroostook, with office at Derby, Me., has previously been announced in these columns, began railroad work in 1886 on the Lehigh Valley at Wilkesbarre, Pa., as a machinist. Before 1901 he had been made gang foreman and then general foreman of this shop. In 1901 he was appointed

general foreman of the locomotive department of the Delaware, Lackawanna & Western, with office at Scranton, in charge of the Scranton shops. In 1903 he was made master mechanic of the Scranton division, holding this position until May, 1911, when he went to the New York, Ontario & Western in charge of shop construction work at Middletown, N. Y. After the shops at that place had been completed, he was made shop superintendent, which position he held until June 1, 1914.

A. F. Dorley, whose appointment as principal assistant engineer of the Missouri Pacific, with headquarters at St. Louis, is announced elsewhere, was born April 8, 1875, at Lancaster, Pa. He was graduated from Mt. St. Mary's College, Emmitsburg, Md., with the degree of A.B., and from Notre Dame University, South Bend, Ind., in 1900, with the degree of C.E. He began railway work in June, 1900, with the Baltimore & Ohio Southwestern as rodman. From January, 1901, to June, 1902, he was assistant engineer on the Cleveland, Cincinnati, Chicago & St. Louis, returning to the Baltimore & Ohio Southwestern on the latter date as assistant engineer. He was transferred to Washington, Ind., as assistant engineer in April, 1903, and in April, 1906, he went to the Missouri Pacific as assistant engineer at St. Louis, Mo., being transferred to Kansas City in August of that year. In October of the same year he was made division engineer at Omaha, Neb., and in July, 1907, was transferred to Osawatomie, Kan., in a similar capacity. Later he was made division engineer at Kansas City, and in December, 1910, he became superintendent of water service at St. Louis, from which position he is now promoted to principal assistant engineer, as above noted.

A. F. Dorley

OBITUARY

James C. Campbell, formerly vice-president of the St. Louis & San Francisco and chairman of the board of directors of the North American Company, died on June 12 at Greenwich, Conn., aged 65 years.

T. H. Goodman, formerly from December, 1868, to October, 1905, general passenger and ticket agent of the Southern Pacific died in San Francisco, recently, at the age of 84 years.

Alexander Stewart, assistant chief engineer of the Great Northern at Seattle, Wash., died on Saturday, June 6, after an illness of about a year. Mr. Stewart was born April 23, 1854, at Dalhousie, N. B., and was educated at the University of New Brunswick. He began railway work in 1874 as leveler for the Prince Edward Island Railway, and from 1876 to 1882 was successively assistant engineer on the Elgin & Petitcodiac and the Eastern Counties Railway in Nova Scotia. He was then for two years deputy surveyor of New Brunswick, returning to railway service in 1884 as division engineer on construction for the Canadian Pacific. He was subsequently assistant chief engineer of the Alberta Railway & Coal Company, and engineer in charge of construction on the Manitoba & Northwestern until 1886, when he was made chief engineer of railways for the Manitoba government, which position he held for three years. He then became chief engineer of the Calgary & Edmonton in 1889; one year later was appointed chief engineer of the Duluth & Winnipeg, and in 1895 he went to the Great Northern as assistant engineer. Three years later he was made resident engineer, and in 1903 became assistant chief engineer at Seattle. Recently Mr. Stewart was granted leave of absence, owing to continued ill health.

Equipment and Supplies

LOCOMOTIVE BUILDING

The Chicago, Milwaukee & St. Paul is in the market for five mikado type locomotives.

The Carolina, Clinchfield & Ohio has ordered from the Baldwin Locomotive Works two Pacific type locomotives.

The Chicago, Milwaukee & St. Paul has ordered 10 steel coaches from the Standard Steel Car Company and 2 mail, baggage and express, 2 passenger and baggage, 3 observation, 1 dining and 11 sleeping cars from the Barney & Smith Car Company. This company is also in the market for 200 tank cars.

CAR BUILDING

The New Orleans Great Northern is reported in the market for one combination mail and passenger car.

The Illinois Central is reported to be in the market for 2,000 box cars. These are in addition to the 3,000 recently ordered.

IRON AND STEEL

The Chicago, Indianapolis & Louisville has ordered 3,000 tons of rails from the Illinois Steel Company.

The St. Louis & San Francisco has ordered 9,000 tons of steel rails from the Tennessee Coal, Iron & Railroad Company.

The Illinois Central has ordered 1,000 tons of steel for track elevation work at Chicago, from the American Bridge Company. Two thousand tons are yet to be ordered.

The Chicago, Milwaukee & St. Paul has ordered 210 tons of material for a 140 ft. through highway truss span for Rose street viaduct, at North La Crosse, Wis., from the Chicago Bridge & Iron Company.

Discipline on the London & Northwestern.—A bulletin showing the list of fines imposed on various mechanical employees on the London & Northwestern, dated August 25, 1892, and signed by F. W. Webb, superintendent, shows how careful this railway was in maintaining its discipline. Enginemen, firemen and cleaners were fined nominal sums for various causes from passing signals set at danger to smoking in the shop. The maximum fine was about $5 for passing a signal at danger and causing a mishap. The smallest fines were two shillings and sixpence, or about 60 cents; these latter fines were levied for causing smoke nuisance, smoking a pipe in a shed, causing damage to lubricator, being late out of the roundhouse, causing delays to trains, overrunning passenger station platforms and for derailments due to carelessness. Other employees were dismissed for disregarding signals, for damaging the paint on an engine with a penknife, etc.

English Smoke Prevention Schemes.—That the smoke difficulty with steam locomotives is a real one may be at once admitted; but that the solution lies in distributing the smoke behind or under the train cannot be accepted. Yet, from the earliest days of the steam locomotive until now, inventors have proposed all sorts of ideas of this kind. One of the most ingenious was tried years ago on the Metropolitan Railway. Between the rails a trough was laid, and the engine carried a sliding shoe device adapted to slide over this, and to open doors as it passed, whereby smoke led from the stack to the shoe was enabled to pass into the trough, thence being exhausted to a collecting plant. Other ideas consisted of extension stacks leading to the back of the train. And now another scheme of the same class is presented in which a smoke conveyor extends from the stack to a point at one side of the engine and near the rear driving wheel.

Supply Trade News

Harvey W. Bell, founder of the Bell Locomotive Works, Inc., is now connected with the H. K. Porter Co., Pittsburgh, Pa., in the manufacture of gasolene steam locomotives.

Terry Steel Turbine Company, Hartford, Conn., announces that it has recently installed additional machine tools in its plant, increasing the capacity by, approximately, 25 per cent.

The second-hand locomotive, car and railway equipment business of the late J. T. Gardner will be continued under the name of James T. Gardner, Inc., with M. Gardner, president; R. H. Gardner, vice-president; A. V. Talbot, secretary and general manager, and A. M. Talbot, treasurer. Offices in the Railway Exchange, Chicago.

The Gun-Crete Company has opened its new offices in the McCormick building, Chicago. This company specializes in cement gun work for engineering, industrial and mining structures. The gun-crete process is used for encasing steel bridges, etc., as rust and fire protection for the lining of tanks and reservoirs and for fireproofing wooden trestles. Carl Weber is president of the company.

E. P. Dillon and M. B. Lambert, both of whom have been connected with the railway and lighting department of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., for a number of years, have been appointed to the new positions of assistant managers of the railway and lighting department. Mr. Dillon will have charge of the commercial activities of the company in connection with the generation and distribution of power involving power house substations, transformer stations and similar apparatus. Mr. Lambert will have charge of all sales work pertaining to electric traction, including steam, interurban and city railroads.

Fred A. Poor, whose election to the position of president of the P. & M. Company was noticed in our last issue, was born at Andover, Me., in 1870, and was graduated from the high school at Port Chester, N. Y., in 1887. He went to Chicago in 1892 and worked for the Hall Signal Company on the installation of automatic block signals on the Chicago & North Western and the Illinois Central. In 1893, he took a permanent position with the Illinois Central as signal maintainer; and in 1897 was made supervisor of electric signals throughout the Illinois Central system. In 1900, he left the road and went to the Weber Railway Joint Manufacturing Company as assistant engineer, and soon was made western representative of that company. In 1906, when the Weber Company was merged into the Railjoint Company, Mr. Poor went to Europe, to organize a foreign department; and he remained there two years, as manager of that department, with headquarters in London. In 1909, he returned to America and was made sales agent of the Railjoint Company in Chicago. This place he resigned on the first of the present month to become president of the P. & M. Company.

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F. A. Poor

TRADE PUBLICATIONS

AIR COMPRESSORS.—The Chicago Pneumatic Tool Company has issued bulletin No. 34-C, a 16-page booklet devoted to the description of its gasolene engine driven compressors.

Railway Construction

DETROIT, ALMONT & NORTHERN.—This company is making surveys for a line from Almont, Mich., to Imlay City, 8½ miles. The line is easy and the work light, the earth work averaging about 5,000 yards per mile. The president of the company is F. W. Brooks, Detroit, Mich.

EAST & WEST COAST.—This company, which started work last year on a line from Bradentown, Fla., southeast to Arcadia, 53 miles, has track laid on 2.5 miles, it is said, to the Braden river. The grading work is nearing completion, and track laying will be continued as soon as work is finished on a bridge now under construction over Braden river. Allen W. Jones, president and general contractor, Bradentown. (December 26, p. 1249.)

FORT WORTH SOUTHERN TRACTION COMPANY.—See Tarrant County Traction Company.

ILLINOIS CENTRAL.—Contracts for the grade reduction work between Princeton, Ky., and Paducah, have been awarded as follows: Walsh Construction Company, Davenport, Iowa, Iron Hill division, 500,000 cu. yd.; Winston Bros. Construction Company, Minneapolis, Minn., Dulaney division, 400,000 cu. yd., and the Grand River division, 70,000 cu. yd. H. V. Hodges Construction Company, Birmingham, Ala., Princeton division, 120,000 cu. yd. The total cost is estimated at $700,000.

KENTUCKY ROADS (Electric).—According to press reports plans are being made to build a line from Taylorsville, Ky., northwest to Jeffersontown, about 20 miles. I. J. Jewell, Taylorsville, is interested.

NORFOLK & WESTERN.—A contract has been awarded to Mason & Hanger of Lexington, Ky., for the construction of a second main track from Waverly, Va., to Disputanta, nine miles.

NORTHERN ELECTRIC.—Plans have been made, it is said, to build a line from Woodland, Cal., southwest to Vallejo, about 50 miles. The company now operates 141 miles of track between Chico, Cal., and Sacramento and a branch from Chico to Hamilton. L. Sloss, vice-president, San Francisco, Cal.

PETALUMA & SANTA ROSA.—See San Francisco & Northern.

ROCK FALLS & SOUTHERN TRACTION.—Incorporated in Illinois, with office at Rock Falls, Ill., to build an electric line through Rock Falls, Sterling, Deer Grove and New Bedford to Kewanee, about 40 miles. The incorporators include B. G. Neville, W. Usburne and G. F. Young.

SAN FRANCISCO & NORTHERN (Electric).—Application has been made in California for a charter to take over the rights and property of the Petaluma & Santa Rosa, it is said, which operates about 42 miles of electric lines out of Petaluma, Cal. It is understood that the plans of the new company call for building from San Quentin in Marin county to Santa Rosa, about 42 miles. (April 3, p. 812.)

SUTHERLIN, COOS BAY & EASTERN.—An officer writes that surveys will be made in the near future for building a line from Sutherlin, Ore., east about 27 miles to a tract of timber at the head of the Calapooia river. Contracts for grading, etc., will be let in about 30 days. The work is easy. H. D. Haley, Sutherlin, Ore., is interested. (May 22, p. 1171.)

TRI-STATE RAILWAYS COMPANY OF MICHIGAN.—It is reported that 90 per cent. of right of way has been secured and that surveys are being made on the 18-mile section from Hillsdale, Mich., south to Pioneer, Ohio, which is part of the projected line from Adrian, Michigan, to Elkhart, Ind. The projectors plan also a branch from Adrian, Mich., northwest to Jackson. (October 17, p. 727.)

VIRGINIA-BLUE RIDGE.—An officer writes that the company plans to build about 22 miles of railway from Tye River, Va., which is on the Southern Railway, north by Lowesville to Marries Mill. There will be two steel bridges, each 50 ft. long, also 5 trestles and one tunnel on the line. The company expects to develop a traffic in lumber, iron, ore, rutile, kaolin,

farm products and crushed stone. John W. Dwight, president, Ithaca, N. Y.; R. G. Leftwich, vice-president, Lynchburg, Va.; A. K. Murrell, chief engineer, Tye River, Va. (June 5, page 1257).

Virginia & Carolina Southern.—A contract is reported let to J. R. Adams & Co., Richmond, Va., to build an extension from Elizabethtown, N. C., to Browns Landing, 2 miles. The work includes constructing a trestle 350 ft. long.

Washington & Lincolnton.—Incorporated in Georgia with $100,000 capital, to build from Washington, Ga., northeast to Lincolnton, about 20 miles. The incorporators include W. B. Crawford and W. C. Powell, Lincolnton; K. A. Wilhoit, Washington; C. M. Strahan is the chief engineer, Athens.

Western Dominion.—This company, which was incorporated about two years ago, now plans to build from Calgary, Alta., south to Cut Bank, Mont., on the Great Northern, about 232 miles. The dominion government has voted a subsidy of $6,500 a mile and the estimated cost of construction is $30,000 a mile. American and English capitalists are interested in the project. The survey has already been made, and it is expected that construction work will be started this summer at Lundbreck, Alta., from which point the line will be built north to Calgary and south to Cut Bank, crossing the international boundary at Whiskey Gap. The line will open up coal fields in the section south of Calgary. At the time of incorporation the provisional directors included J. E. Asquith and O. F. Culbert, Ottawa, Ont., and H. McI. MacCullum, Regina, Sask.

RAILWAY STRUCTURES

Albuquerque, N. M.—The Atchison, Topeka & Santa Fe has authorized the construction of a reinforced concrete high-type engine house, crane runway, radial tracks and turntable, at an approximate cost of $100,000.

Boston, Mass.—The Massachusetts Public Service Commission and the directors of the Port of Boston have approved the plans of the Boston Elevated for a new bridge to carry the elevated tracks over Mystic river, on the extension of the road to Malden. (May 8, p. 1055.)

Chicago, Ill.—Plans for the proposed new union station and freight terminals as provided for in ordinances recently passed by the Chicago city council, have been approved by the Illinois Public Utilities Commission. No definite date has yet been set for beginning work. The Pennsylvania Lines, the Chicago, Burlington & Quincy and the Chicago, Milwaukee & St. Paul, the roads which now comprise the Union Station Company, are negotiating for some property of the Chicago & Alton, and it has not yet been determined whether the Alton will be a joint owner or a tenant in the station.

Flagstaff, Ariz.—The Atchison, Topeka & Santa Fe has authorized the construction of a 50,000,000-gallon reservoir and additional pipe lines, at an estimated cost of $200,000.

Freeport, Tex.—A bridge is to be built across the Brazos river to connect Velasco and Freeport, the Houston & Brazos Valley railroad having signed a contract for the joint building of the structure by the county commissioners and the railroad company. The Midland Bridge Company, of Kansas City, was awarded the contract for both the concrete sub-structure and the steel superstructure. The steel will be furnished by the Virginia Bridge Company, Roanoke. The bridge will be 500 ft. long and have three fixed spans and a draw span. The draw span will be 250 ft. long.

Prairie du Chien, Wis.—The Chicago, Milwaukee & St. Paul is now completing a new pontoon bridge across the east channel of the Mississippi river at Prairie du Chien, with a pontoon span 209 ft. long and a fixed span 161 ft. long, replacing a light wooden structure 396 ft. long. This structure will be swung into position after the close of navigation this fall. It is planned to rebuild a similar structure over the west channel later in the season. The estimated cost of the structure over the east channel is $60,000.

Statesboro, Ga.—The Savannah & Statesboro has just completed a small one story 66 ft. x 72 ft. repair shop at Statesboro.

Railway Financial News

Atlanta, Birmingham & Atlantic.—The property of this company was sold under foreclosure on June 13, and was bid in by the General Protective Committee with the understanding that a general organization committee would be chosen from the General Committee and from the committee representing the receiver's certificates which general committee is to work out a plan of reorganization. There are $3,774,000 receiver's certificates outstanding and $4,090,000 underlying Atlanta & Birmingham bonds on which no default has as yet been made. Junior to these securities there is outstanding $14,185,000 first mortgage Atlanta, Birmingham & Atlantic, 5 per cent. bonds.

Atchison, Topeka & Santa Fe.—The Kansas & Southwestern, which runs from Arkansas City, Kan., to Anthony, 60 miles, and which has heretofore been operated jointly by the Atchison, Topeka & Santa Fe and the St. Louis & San Francisco, has been taken over by the Atchison, Topeka & Santa Fe.

Boston & Maine.—Robert Winthrop & Co., of New York, were given a verdict for $50,000 and interest against the Boston & Maine on undeposited notes which were presented for payment. More than 90 per cent. of these notes were deposited under an agreement for an extension and, apparently, this verdict gives the holders of the minority undeposited notes a right to payment in cash.

Delaware & Hudson.—This company has sold to Kuhn, Loeb & Company, New York, and the First National Bank, $4,500,000 first and refunding mortgage 4 per cent. bonds due 1943.

Great Northern Equipment.—This company has been incorporated in Minnesota with an authorized capital stock of $5,000,000. It is understood that the company is to own steamers for the Pacific coast service and make improvements in Glacier National Park. The incorporators are Louis W. Hill, president of the Great Northern; R. A. Jackson, vice-president; L. E. Katzenbach, secretary and treasurer; W. P. Kenny, traffic manager, and R. Budd, assistant to the president.

Kanawha & Michigan Railway.—The Public Utilities Commission of Ohio has approved the issue of $1,200,000 4½ per cent. equipment trust notes payable in semi-annual instalments. The notes are to be sold at not less than 99½, and the proceeds of the sale are to be used to pay in part for seven consolidation locomotives, two baggage and express cars, five all-steel passenger cars and 1,160 steel gondola cars, the total cost being $1,355,000.

New York Central & Hudson River.—This company has sold through Morgan Grenfels & Co., London, England, part of the $4,000,000 New York Central Lines 1913 series of equipment trust certificates, and the remainder will, it is understood, be offered in New York within a short time by J. P. Morgan & Co.

Oklahoma Central.—This company, which has been in the hands of a receiver for some time, has, it is announced, agreed to lease its property to the Atchison, Topeka & Santa Fe, with an option to buy.

St. Louis Southwestern.—After the regular meeting of the directors the following announcement was made: "The board has not felt justified in view of the recent and current operations of the company in approving a dividend at this juncture, although it was hoped that the circumstances resulting in this judgment would prove to be temporary only." The company has been paying dividends on its preferred stock at the rate of 4 per cent. annually since October, 1913. Previous to that the annual rate on the preferred was 5 per cent.

Trinity & Brazos Valley.—On application of the Old Colony Trust Company of Boston as trustee for $8,000,000 bonds, Judge Edward Meek of the Federal District Court at Dallas, Tex., has appointed J. W. Robbins, general manager of the road as receiver. The Trinity & Brazos Valley runs from Fort Worth, Tex., to Houston, 272 miles, and is owned jointly by the Chicago, Burlington & Quincy and the Chicago, Rock Island & Pacific.